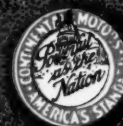


The **AUTOMOBILE** and **Automotive Industries**

Vol. XXXVII
No. 16

NEW YORK, OCTOBER 18, 1917

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America's Choice

Supreme in the truck field, as in the pleasure car field, the Continental Motor is truly America's Choice. For war's arduous duties, no less than for the energetic requirements of peace, it stands first—now as always.

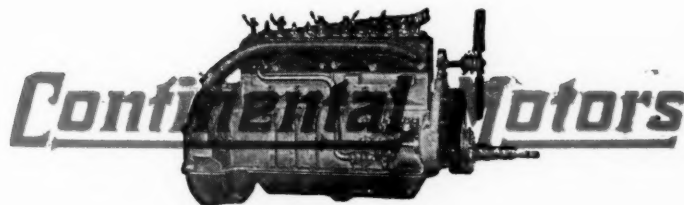
War's stern efficiency has confirmed the peace-time verdict of the motor vehicle industry. More than 160 manufacturers of pleasure cars and trucks use the Continental Motor in one or more of its models. These manufacturers today constitute the most successful group in the motor vehicle industry. They chose the Continental Motor as America's standard, and warring America has backed their judgment.

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Offices:
Detroit, Mich.

Factories:
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Largest exclusive motor manufacturers in the world.





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The Van Sicklen Company, Elgin, Ill.
Factory—Elgin National Watch Company

The AUTOMOBILE and Automotive Industries

VOL. XXXVII

NEW YORK—THURSDAY, OCTOBER 18, 1917—CHICAGO

No. 16

War Trucks Reach Capital



AT noon on Friday, Oct. 19, the two standard military trucks will be officially presented to Secretary of War Baker, who will officially accept them for the War Department. The ceremony will be of a formal nature, the trucks being first handed over to A. W. Copeland, chairman of the production schedule committee for the experimental trucks. He, making a short speech, will hand them over to General Chauncey B. Baker, who will in turn present them to Secretary of War Baker, with another speech.

There will be present the heads of the engineering divisions who did the designing work, while the President and members of the Cabinet have been invited to attend the ceremony.

Each of the two factories where the assembling was done is over 450 miles from Washington, and the runs

were made without trouble, notwithstanding wet mountain road conditions. The trucks were not unduly pushed, it being considered that prolonged night driving introduced more risk than the short time gained warranted.

The truck from Rochester, being supplied with banners stating what it was, attracted huge crowds en route, and official receptions were arranged for it in several towns, notably in Harrisburg, where there was a big turnout of civic dignitaries.

This ends the first stage in the development of the truck. Next comes the intensive testing of the experimental models. Meanwhile, the work of preparing for production proceeds. Schedule has been beaten on the experimental work, and it is hoped to beat schedule again on production, which starts Jan. 1, and is to be in full swing by the end of that month.

The First of the Standard Military Class B Trucks

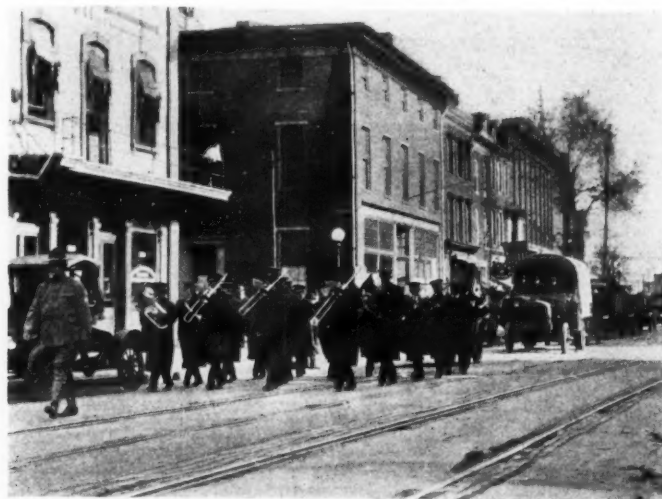


The start from the Rochester factory

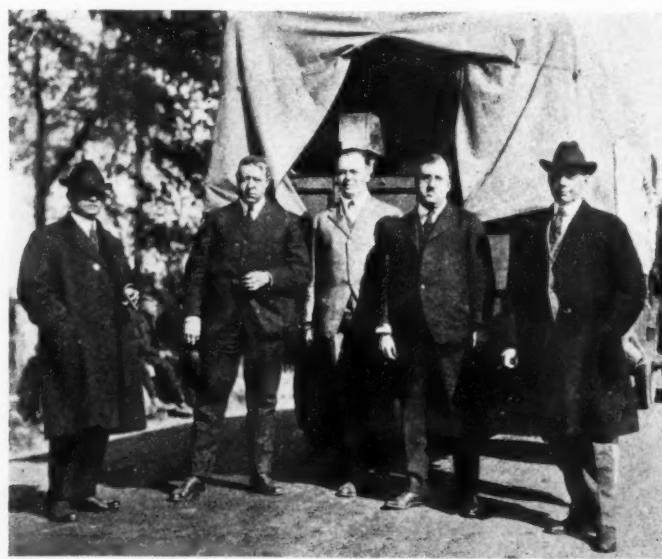
All Sorts of Roads
Encountered on
the Trip



Topping a rise in the Pennsylvania mountains. A bridge that caused a change of route. Good going near Muncy, Pa., on dirt road



Martial honors accorded at Harrisburg, Pa.



Nearing the destination. Left to right—Christian Girl, in charge of truck production; W. T. Norton, Chief Engineer Selden Co.; Coker F. Clarkson, H. L. Horning and A. W. Copeland

En Route from Rochester, N. Y., to Washington, D. C.

Popular Enthusiasm
Much in Evidence
Throughout



Crowds meet the truck at Harrisburg, Pa.



The Liberty truck at Liberty Garage, Liberty, Pa.



Leaving Muncy, Pa. Entering Ridgewell, Md., on about the widest road encountered, and "occupying" a well engineered mountain road



Taking a crossing at 15 m.p.h. without a jar

Engine-Supporting Methods

One School of Designers Favors Rigid Frames and Four-Point Support and Another Flexible Frames and Three-Point Support—Details of Supporting Systems Analyzed

By P. M. Heldt

AN interesting problem in connection with car design is that of the method of supporting the engine on the frame. There are evidently both good and bad methods, for on the one hand we hear much complaint of engines coming loose, while on the other we hear makers assert that their method of engine support has never given any trouble.

To begin with, there are two pairs of alternative systems of engine support—namely, main frame and subframe support on the one hand and three-point and four-point support on the other. As far as passenger cars are concerned subframe support is practically obsolete, all engines being supported directly on the main frame. The advantage claimed for the subframe was that it protected the engine against distortion of the main frame due to road unevenness. It is probably correct that the subframe was introduced as a result of trouble with direct main-frame support at four points. The subframe construction, however, did not seem to be a very happy solution of the problem, as it adds to the weight and complication and at best relieves the engine only partly of stresses due to main frame distortion.

Four-Point Support

Four-point support continues in use especially among some of the best known manufacturers. It requires a rigid crankcase and substantial supporting arms, and of course makes the frame rigid. The Locomobile Co., for instance, which uses a cast bronze crankcase, casts it with four integral arms which rest directly on the main frame. One objection to the method of supporting the engine directly on the main frame by arms cast integral with the crankcase is that these long arms make the crankcase rather unwieldy in machining. If the engine has a bell housing for the flywheel the two rear supporting arms are cast on it and do not need to be very

long. In fact the supporting members are then generally referred to as feet and are rather inconspicuous. Of course, the supporting members are always cast on the top half of the crankcase, as the lower half must be removable while the engine is in the chassis, for purposes of bearing adjustment. In some unit-power plants the bell housing is on the transmission case, the crankcase having only a flange joining the bell housing. In that case the two rear supports are on the transmission case.

Crankcase Arm-Frame Joints

An important point is the method of securing the arms to the light channel of the pressed-steel frame. The requirements are that the engine must be held securely, that the frame must not be appreciably weakened, and that it must be possible quickly to free the supporting arms when it is desired to remove the engine from the chassis. A variety of designs is herewith illustrated. The arm is usually formed with a lateral flange which rests on top of the frame channel. The frame channel, of course, must be filled where the engine arm bolts to it, as otherwise it would be distorted by the bolt pressure and weakened. On the Locomobile metal filler blocks are used, of what may be described as I-form. These are of slightly less height than the inside height of the channel, so they need not be rounded at the corners to conform to the rounded corner of the channel, and of somewhat greater width than the inside width of the flange, so the end of the supporting arm rests against the filler block and not against the flange of the frame rail. The hole through the filler block is materially larger than the bolt passing through it, hence the latter is not subjected to shearing strains. To facilitate the removal of the bolt, its head is slotted, so it can be turned out with a screwdriver.

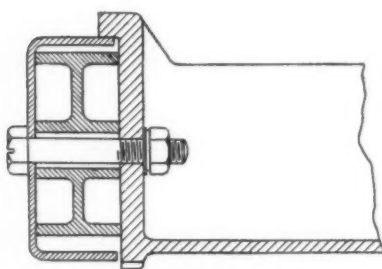


Fig. 1—Locomobile filler block

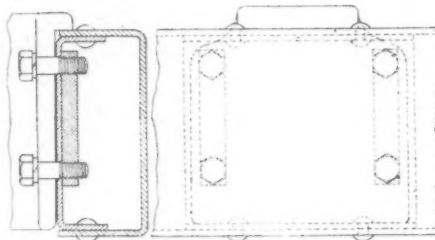


Fig. 2—Winton filler block

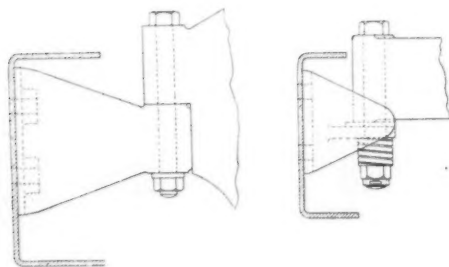


Fig. 3—National front and rear supports

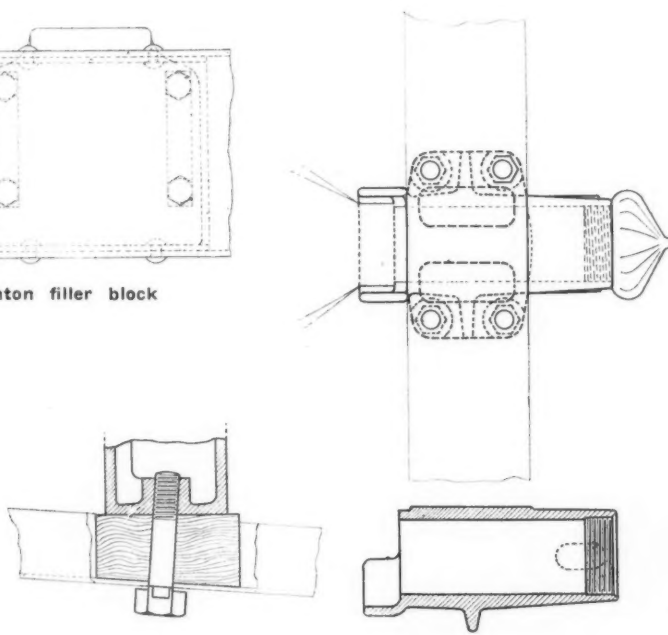


Fig. 4—Briscoe filler block and front support

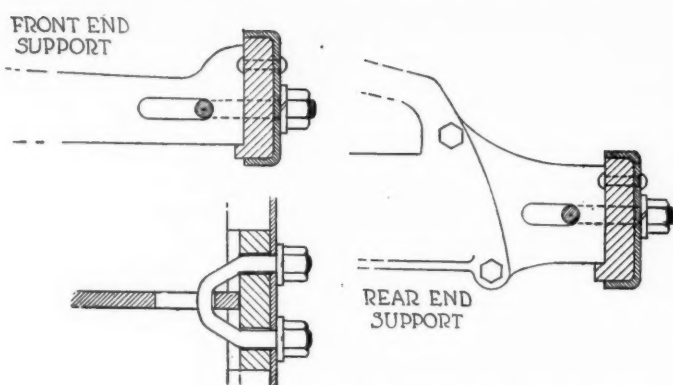


Fig. 5—Chevrolet method of securing engine supports to frame

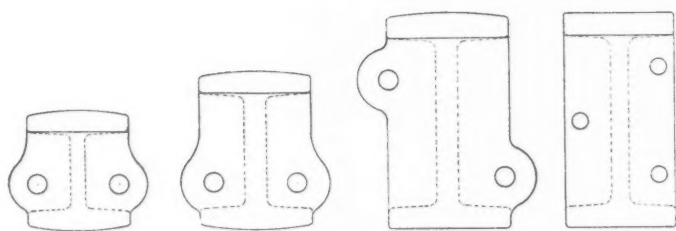


Fig. 6—Layout of engine arm pads

Instead of a filler block of cast metal some makers use a pressed-steel filler, and an example of this is furnished by the Winton car. A piece of channel section pressed-steel fitting the inside of the frame channel is secured to the latter by riveting. The end of the supporting arm is of the usual form, with a flange resting on top of the frame channel and a machined vertical surface which is drawn up against the frame by means of four cap screws which enter screw plates back of the filler channel. It will be noticed that the filler channel projects slightly from the frame channel so that the engine can readily be lifted out of the frame after the screws have been removed, and that shims are used between the crankcase arm and the frame. This method of fastening the engine to the frame has the advantage of neatness, in that there are no rivet or bolt heads showing on the outside of the frame. Also, the bolts are accessible and do not make removal of the engine difficult. Of course the rivets in the top and bottom will somewhat weaken the section, but since they are small in size the weakening effect will be unimportant, especially in view of the heavy frame sections now in use on most high-grade cars.

Flexible Four-Point Support

Both of the foregoing examples of crankcase arm-frame joints are used in connection with four-point supports. Some designers, realizing the strains which the rigid four-point support imposes upon the crankcase, have sought to obtain the flexibility of the three-point support. One scheme, which has been used to some extent, consists (Fig. 3) in securing the engine, by means of crankcase arms, rigidly to the frame at one end and supporting it by a bell-crank and link arrangement at the other. This will certainly greatly reduce the strains on the crankcase, but the support is complicated and unwieldy and has never come into extensive use.

A somewhat similar plan has achieved a greater degree of popularity.

This consists in securing the crankcase rigidly to the frame at one end and incorporating a yielding member, usually a coiled spring, in the support at the other end. This plan is followed in the National car. Both front and rear supports are shown herewith. Small brackets are riveted to the inside of the frame channel and the engine arms are set onto bosses on these brackets. But while the rear arms are rigidly bolted to the brackets, the front arms are not rigidly held down, short, stiff coiled springs being inserted under the nuts on the bolts. The manufacturers claim that this form of modified four-point mounting has all the advantages of the three-point mounting without some of the latter's disadvantages, notably lack of accessibility of the camshaft gears. It is also alleged that with the ordinary three-point mounting the flexibility of the crankcase allows the front end of the engine to vibrate sideways, as a result of torque reaction.

Types of Filler Blocks

The Briscoe furnishes an example of the practice of using wood fillers in the frame channel. This engine has a three-point support, a universal support in front on the starting shaft hub and two arm supports at the rear, short supporting arms being cast on the bell housing. The wood filler blocks used are shaped to conform to the slight taper of the frame, while their inner surfaces and the corresponding surfaces of the crankcase arms are faced off square. Bolts are passed through the frame from the outside and through the wood block and screwed into bosses cast in the supporting arms. They are secured by special block washers. These bolts are put through perpendicular to the frame members, and therefore at an angle to the engine arms.

A further variation in the crank-arm frame joints is found in the construction of the Chevrolet Motor Co. Stamped steel supporting beams are used, the ends of which rest on a ledge formed on a filler block for the frame channel. The filler block is riveted to the frame and the supporting member is secured to the frame by means of a V-bolt passing through a slot punched in the supporting member and through holes drilled in the frame and the filler block.

In laying out the ends of the supporting arms care must be taken to get the bolt holes in such positions that the bolt heads or nuts can be reached with a wrench. A number of different layouts are shown in Fig. 6.

Three-Point Support

The principle of the three-point support is that of the three-legged stool which stands firmly on any floor. The stool, however, is subject only to gravitational forces, which are invariably in one direction, whereas the engine is subjected to a variety of forces in practically every direction. It is not practical merely to rest the engine on the frame at three points, but it must be secured to the frame so it cannot shift on it nor jump off it. The most common form of frame distortion which has to be guarded against is the so-called "weaving." This means a twisting of the frame under road strains such that a line connecting, say, the central points of engine support at the rear is no longer parallel with a line connecting the center points of the engine support at the

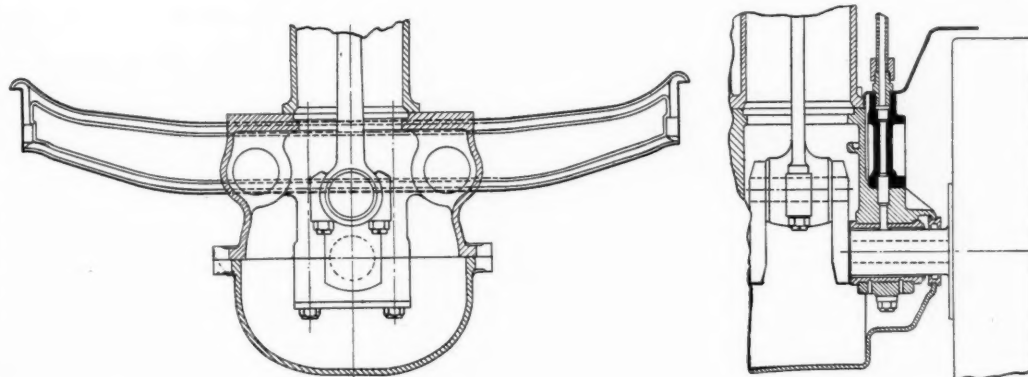


Fig. 7—Pierce-Arrow rear support

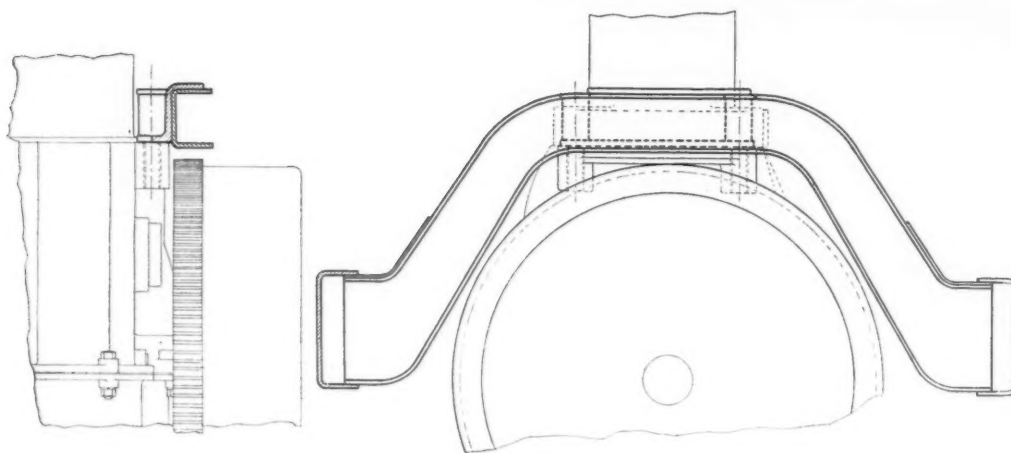


Fig. 8—Moline-Knight rear support

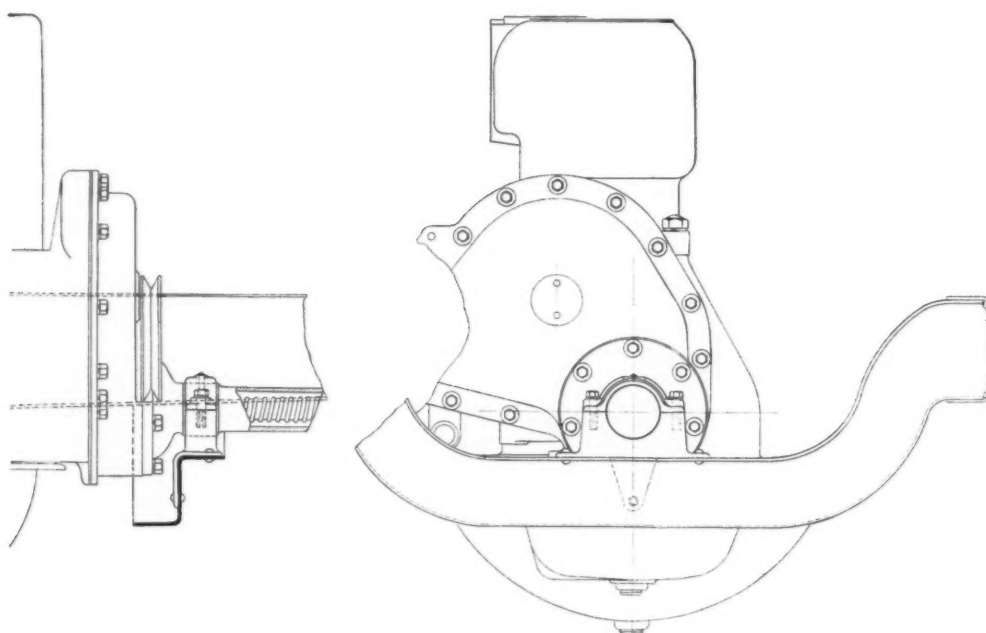


Fig. 9—Case front support

front. The frame, of course, can also distort in other ways. For instance, if one front spring horn should run up against an obstruction the rectangle formed by lines connecting the four points of the engine support would be deformed into a trapezoid, with resulting strains on the engine. With a three-point support, if the supports are ball-shaped, for instance, weaving does not impose any strains on the engine, but lateral distortion of the frame will.

"Point Support" a Misnomer

Entirely to eliminate strain on the engine due to frame distortion, one end of the engine must be free to move lengthwise and crosswise relative to the frame. This necessitates sliding supports, and it is generally considered unnecessary to provide this degree of flexibility. In fact, the so-called three-point support is not a point support at all, all of the supports having considerable area and some at least always being rigidly bolted. It is evident that there is no need to eliminate all stresses on the crankcase. If the stresses are limited so that no breakage and no serious grinding of bearings occurs, all reasonable requirements are met. Even the least perfect form of three-point support, in which each support consists of a relatively large bolted surface, greatly reduces the strain on the crankcase. Whether it is superior to the four-point support is another matter, as that depends largely on the ability of the crankcase to withstand the kind of strains imposed by frame distortion.

A rather unusual method of engine support is employed by

the Pierce-Arrow Motor Car Co. The engine is supported by forged beams at both ends. These beams extend across the front and rear crankshaft bearings and the same studs which hold the bearing caps in place also secure the supporting beams to the crankcase. This, of course, must be classed as a four-point support, but the effects of frame distortion on the crankcase would be far less than where the engine is supported by integral arms. Since the two studs are so close together and are comparatively long the elastic extension of the studs will compensate for a lot of frame distortion.

Three-point supports embracing two supporting surfaces on arms which are cast integral with the crankcase and a third supporting surface on a cross-beam bolted to some part of the crankcase are quite common. Most frequently the two supporting arms are at the rear, extending out from the bell housing, but in the Moline-Knight they are in front. At the rear end the engine is suspended from an arched frame member of pressed steel. This cross member is secured to the frame with large gusset plates and to the engine crankcase by means of two lugs cast on the rear end of same and an intermediate piece (probably of cast steel) which rests on top of and is riveted to the cross-member and bolted to the crank chamber lugs. The front arms do not extend all

the way out to the frame side rails but rest on brackets that are riveted to the frame. Thus the weight of the engine in front rests squarely on the supporting surface and the point between the supporting members and the frame is a permanent one. This type of support is favored by many engineers. The mounting described is used on a car which has a separate transmission located amidship, but there seems to be no reason why it could not be used equally well for a unit-power plant. It has proved very satisfactory in every respect, according to the manufacturer.

Variety in Front Supports

Where the third point of support is at the front there is quite a variety in the connection between the cross-beam and the engine. In one of the Overland models, for instance, the front bearing cap is forged with two arms which rest on a frame cross member and are bolted to it. In the Briscoe, to whose rear support reference has been made already, an unusual front support is used. The starting crank bracket, which is bolted to the under side of the front cross member, at the rear has a semi-cylindrical extension in which rests the front hub of the engine. On the cover plate of the cam gear housing is formed a comparatively long hub and it is the extreme end of this hub which rests in the supporting bracket on the frame.

There are many designs of engine support in which a forward cross-beam has a swivel joint with the engine. The Case front support, herewith illustrated, is of this type. A

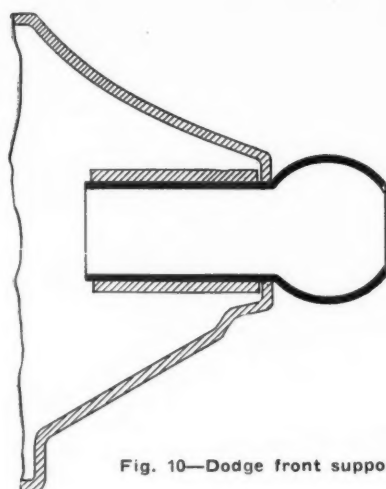


Fig. 10—Dodge front support

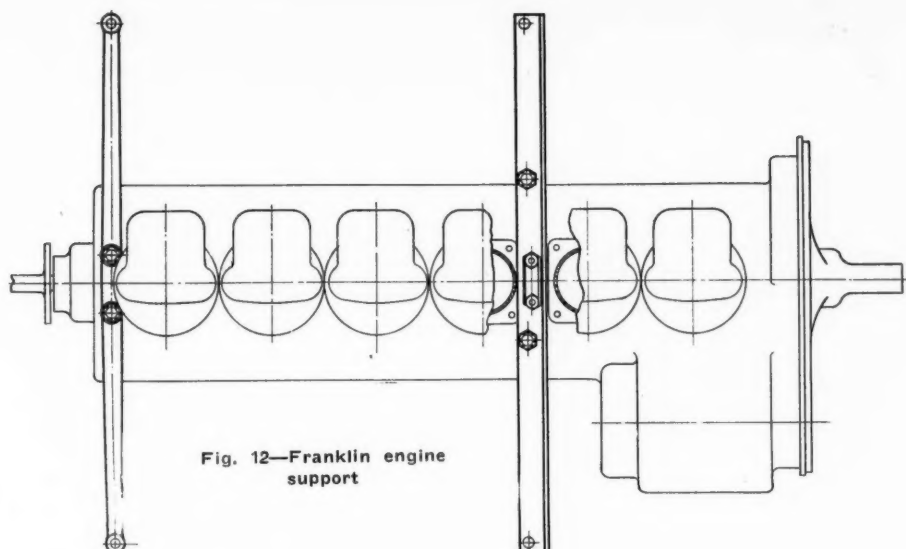


Fig. 12—Franklin engine support

pillow block is riveted to the front cross-channel of the frame and the forwardly extending hub of the engine, which is turned down cylindrically, rests between this pillow block and its cap. This general method of supporting the engine in front by means of a swivel support on its forwardly extending hub is in very extensive use. The objection to it is that it is impossible to take off the gear housing cover without removing the engine from the frame. Also, in case of a long engine, the space between the engine and radiator is generally very much cramped and it is difficult to find room for the supporting member.

The first mentioned objection, that of cutting off access to the camshaft gears, can be overcome by placing the swivel joint either above, to the rear or below the cam gear housing. A good plan is to secure a forked steel bracket to the crankcase directly back of the camshaft gear housing, by means of the front main bearing studs, and pass the front supporting member through this forked bracket. The fan bracket may then be secured to the top of the cross-beam.

In another design the front cross beam is swiveled to the engine below the crankshaft, and to this end is "dropped."

There seems to be no reason why a swivel support cannot be used at the rear end of the engine, but the writer knows of no case where it is used. Of course, in the great majority of cases there are two points of support at the rear and one in front, because even with a separate engine there is much more weight to be supported at the rear than at the front, on account of the flywheel, and with a unit power plant the disproportion is even greater. With the great weight to be supported designers are inclined to use the most direct method of support possible, and that is either arms cast on the crank case or bell housing or else a cross beam to which the engine is secured by the rear main bearing studs which are made in the form of "through bolts."

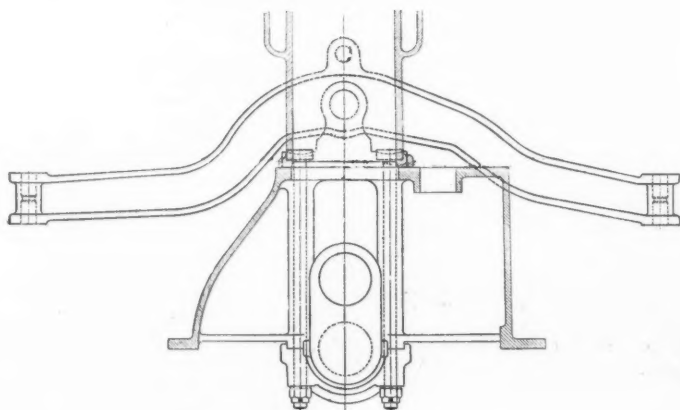


Fig. 11—Rutenber front support

An interesting method of support, and which is probably the most flexible in practical use, is that on the Dodge Brothers car, which is covered by patent. There are two supporting arms cast on the bell housing of the transmission case, and these enter the channel of the frame side sill and are secured to same by one bolt each passing vertically through the flanges of the sill and through the supporting arm. At the forward end in front of the cam gears there is a rather long hub surrounding the starting crankshaft. Into this hub is inserted a steel sleeve which projects from the hub and has its projecting part developed into spherical shape. This ball rests in a socket on the front cross member of the frame. As the ball may rotate in its socket in every direction and as the sleeve may, in addition, slide in its hub, the forward end of the engine has an unusual degree of freedom.

In Fig. 12 is shown the method of supporting the Franklin six cylinder, air cooled engine on the frame. One pressed steel angle and one rolled steel angle are used, both extending across the frame. The unusual feature is that the frames, instead of being placed at the forward end of the engine, pass between cylinders Nos. 2 and 3. This tends to more evenly divide the weight between the two supporting members.

A Needed Convenience

ON the majority of cars and trucks it is not very easy to obtain a small quantity of gasoline when such is required for priming or cleaning purposes. On a few machines a drain cock is fitted in the bottom of the carburetor bowl, and with the modern high-placed carburetor this makes an ideal source of supply. In cases where there is a screen in the gasoline line this also is most accessible when directly under the carburetor. It would seem a good idea to combine screen, shut-off cock and drain cock in one fitting which could be attached permanently beneath the bowl of the carburetor. There ought also to be a shut-off cock as near as possible to the tank in the cases where gravity feed is used, because this allows the main supply to be isolated in the case of a carburetor fire.

Unsinkable Ships

A MEETING was recently held at Genoa to discuss means of defense against submarine attack and the rebuilding of the Italian merchant marine. It was attended by representatives of shipyards, airplane factories and machine shops. *L'Economista d'Italia* for Aug. 23 states that various proposals were considered which would tend to make present and future ships unsinkable. It was decided to nominate a special committee of engineers and technical men to standardize the construction of ships now about to be put in hand, and to specify the number of watertight compartments with a view to securing the flotability of the ship.



Mr. Birger Jacobsson, of the J. B. Crockett Co., New York, who has just returned from an extensive trip through Scandinavia. Mr. Jacobsson is honorary correspondent for the Royal Automobile Club in Christiania and Copenhagen.

American Cars Will Lead In Scandinavia

Present Unfilled Demand for Our Motor Vehicles and Accessories Will Continue After War—Paying \$1 to \$3 a Gallon for Gasoline

SCANDINAVIA promises to be a fertile field after the war for the sale of American automobiles, trucks and tractors, according to Birger Jacobsson, representing the Scandinavian division of the J. B. Crockett Co., New York. Although motor vehicle use in this part of the world is at present at a standstill, there is plenty of money ready for the purchase of cars, trucks and tractors when the war is over, when normal shipping conditions will prevail. That is the big problem at present. Difficulties in importing, hampering of shipping conditions, etc., have all had their potent effect on motor vehicle use in the Scandinavian countries, Sweden, Denmark and Norway. Mr. Jacobsson has just returned from an extensive trip through this section, and the results of this trip have impressed him with the fact that close attention should be paid these countries in the competition for trade after the war.

Restrictions Disappear

The automobile is really starting in Scandinavia where the United States began 10 years ago. The people have awakened to the needs of the motor vehicle. Public garages are being built; the farmer's hatred for this class of vehicle has disappeared; legal restrictions have been eliminated; plans for good roads are on the way; and in fact everything that opposed the progress of the motor vehicle 5 years ago has been eliminated by an insistent demand from people who have suddenly become rich from war business.

Conditions in these three countries are now abnormal. The use of gasoline is practically prohibitive on account of the scarcity and the unusually high price, ranging from \$1 to \$3 a gallon. Its use has been regulated by all the countries. A royal decree has just been issued in Sweden to conserve that country's supply of gasoline. Permission to buy gasoline there must be secured from the Industrial Commission. Before the issuing of the royal decree Sweden had a fixed price for all gasoline held by the Government.

Gasoline \$3 a Gallon

On the other hand, those who had large amounts of gasoline in store and who were not under a license sold this fuel above \$3 a gallon. Gasoline in Sweden has always been high. At the beginning of the war it sold at 45 cents a

gallon. As a means of conserving the supply before the recent royal decree, the Danish Government made it a rule to take over 700 out of every 1000 gal. received by a dealer. Now supplies have become so scarce that hardly any one can buy. Even the royalty are using horses instead of automobiles. Only in long runs are automobiles being used, and even then much consideration is given in the use of the railway.

There are very few tires in Sweden and Norway, and though Denmark has a limited number of tires, only 50 per cent of them are being used because of the scarcity of gasoline. In many cases Swedish buyers are paying \$300 for one tire. The accompanying photograph gives a good illustration of what is considered a good tire in Sweden and Denmark. The Royal Automobile Club of Norway is now licensing all buyers of tires and is co-operating with Great Britain to see that none of these get out of the country.

As a result of the scarcity of gasoline, the use of alcohol and kerosene was considered. Denmark is using a large amount of kerosene and alcohol. Sweden started using wood alcohol, but the temperance league passed rules forbidding it, so that the country is just as bad off as ever.

Great Britain's rules in regard to the shipment of tires to the Scandinavian countries has practically made it impossible for any tires to reach that section of the world. Sweden and Denmark at present are finding it hard to procure import licenses. Consequently few shipments of American goods are reaching these ports.

Truck Market Opened

The scarcity of horses in Denmark has opened up a big market for trucks and tractors. Denmark with a population of 3,000,000 is a big farming country, and has big prospects for the sale of farm tractors. Sweden is mostly industrial and forms a good market for trucks. Norway, on the other hand, concentrates its business activities on fishing and shipping. This country with its huge tonnage will, together with Sweden, after the war handle a lot of transit goods to Russia and with its very good harbors transshipments will be made.

Each section of the world has its own styles of bodies, colors, etc., when it comes to the purchasing of automobiles. Dark and closely allied hues seem to be the predominating colors in Scandinavia. The accompanying illustration shows a prominent American car with a body conforming to Scandinavian body tastes. Disappearing tops and pointed radiators are the two big features of European body design, according to Mr. Jacobsson.

Sweden and Denmark are the only countries in Scandinavia building their own bodies, and it is stated that the demand for



This tire costs \$150 in Sweden



A popular American car fitted with a disappearing top and pointed radiator.

these special bodies cannot be filled. According to Mr. Jacobsson's classification of the wants of three nations, Norwegian buyers want a powerful car, Swedish buyers a powerful car with a good body, and Danish buyers a small or medium-powered car, with a good body.

A little dissatisfaction has arisen in regard to tires. The American companies, it seems, have been sending tires over on their cars in the inch sizes. It is pointed out that millimeter size tires are preferred. Another matter that should be straightened out is that in regard to straight-side tires. This type of tire has been shipped by the tire companies and has caused much trouble to the dealers, who have received their cars with side rims and have been forced to make their own rims.

Russian and Scandinavian Roads Alike

Before the war, and also during the first years of this war, the Russian automobile importers made it a habit of coming over to Sweden to ascertain how well the different cars would stand the roads. If a car got a reputation in Sweden, it was certain that the Russian market would also be opened to it, as the roads in those countries are almost of the same type. As a result of these poor road conditions, low hung cars are not desired. On account of the many short turns that are encountered on these roads, cars with too long a wheelbase are also not wanted.

Scandinavian automobile buyers prefer cars equipped with magneto ignition. Seven-passenger bodies are also very much in demand, for when a Scandinavian car owner wants to go riding he desires his family to accompany him. The two-seated roadsters are wanted in the small car class. Expensive cars with two-seated bodies are rarely seen in Scandinavia.

There is little driving in winter, but still those that do drive in the cities during the cold period much prefer to use enclosed cars.

They have made it a custom to buy two bodies for the chassis, an open for summer and a closed, usually a limousine, for winter.

Swedish Winter Race Important Event

Before the war the Royal Automobile Association in Sweden every February, the hardest winter month, arranged for one of the hardest reliability runs known in Europe—an event of nearly 1000 English miles. From all European manufacturers of importance cars were sent to compete. The cars which until 1914 were successful were the Fiat and the Minerva. After the war these races will commence again and then no doubt American cars will have a chance to compete more favorably, as before no American high-classed cars were ever imported. Mr. Jacobsson will probably attend the race and will also induce American makers to participate in it.

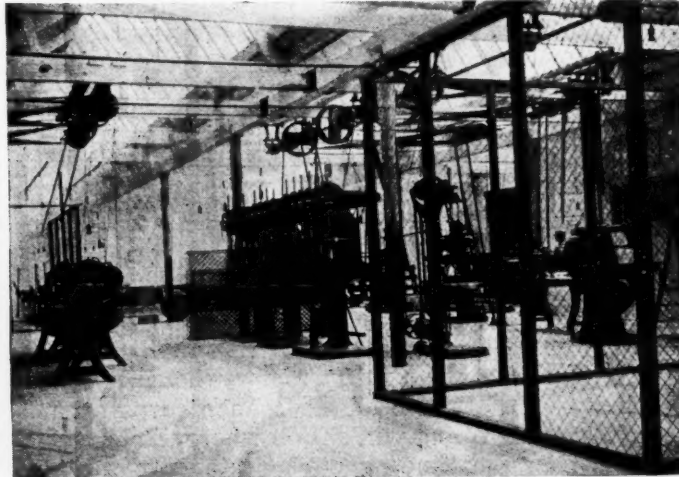
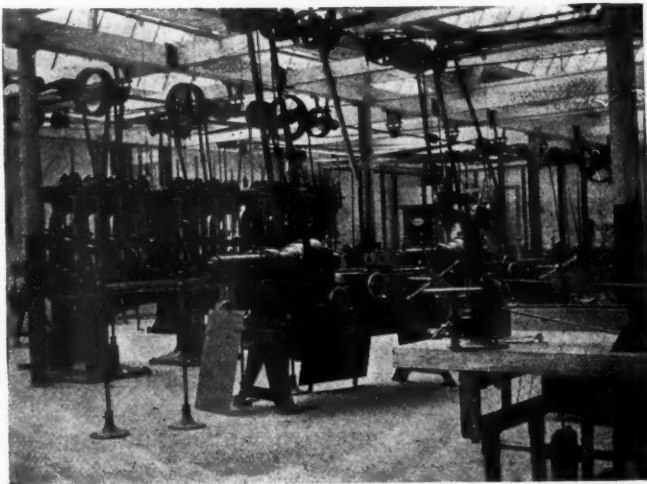
Holley Brothers' English Plant Working

HOLLEY BROS. CO., Detroit, now has its British factory operating, although not as yet under full force. A plant has been erected in Coventry, England, with a capacity for the manufacture of 500 carbureters per week, the full comple-

ment of labor being 120 men. At the present time labor is, of course, very scarce, and there have been long delays in obtaining the necessary machinery of which the great majority has been imported from the United States.

The British Government at present requires the whole output for tractors, and nothing is being made except kerosene vaporizers, of which two models will be produced. The most important is that which fits the Ford tractor and the other will be called the universal pattern and is adaptable to many different kinds of engine. The factory is under the management of Holley Bros.' British representative, T. C. Copson. Mr. Copson is at present in Detroit, having arrived in that city Oct. 2. In his opinion the use of kerosene in England is now so firmly established that its continuance on a large scale after the war is assured.

The company recently received a cable order for 5000 kerosene carbureters from the Ford company in Manchester, England.



Top—Holley carbureter factory in Coventry, England. Bottom—Interior views, showing some of the American tools installed

12 Points on Tax Handling

Views of Treasury Department on Debatable Angles of Automobile Tax Application

- 1—In so far as manufacturers are concerned, the law became effective Oct. 4; manufacturers who sold cars on and after that date will be taxed 3 per cent on their selling price.
- 2—Distributors doing only a wholesale business, and distributors who do both a wholesale and retail business, will be required to pay a tax of $1\frac{1}{2}$ per cent on all cars held and intended for sale on Oct. 4. The date may be set back to Oct. 3, though this is not probable. The purport of this opinion is that distributors doing both wholesale and retail business will have to pay the $1\frac{1}{2}$ per cent tax on all cars held for sale regardless of whether they are for wholesale or retail trade.
- 3—The tax becomes due when the sale is made, and a sale is taken to have been made when title to the car has changed ownership. It does not matter where the car may be—that is, whether actually in the hands of the manufacturers or the purchaser or in transit between the two.
- 4—The actual price obtained for the car by the seller is to be the basis on which the tax is levied, and not the list price unless the car is actually sold for that. In other words, when a car is sold for part cash and part some other consideration, such as a used car, for example, the tax is levied on the price for which the car was sold and not on the amount of cash involved.
- 5—Under existing government laws purchases made for Government use are not taxable. In other words, manufacturers selling cars to the Government will not have to pay a tax on them. Cars sold to foreign governments, however, will be required to pay the tax.
- 6—The Treasury Department is inclined to hold that a chassis is an automobile and is therefore taxable as such.
- 7—Branch houses will be considered as wholesale dealers and as such will be required to pay the $1\frac{1}{2}$ per cent tax on cars held Oct. 4, even though the parent factory holds a majority or the whole of the branch corporation stock. This ruling will obtain where the branch house is a distinct and separate corporation from the manufacturer's corporation.
- 8—Where cars are shipped with special equipment, and billed to the purchaser with such equipment included in the bill, the manufacturer will be required to pay the tax on the full amount. If the car is shipped with its regular equipment, however, and extra equipment or another body is supplied as an extra purchase, the tax would be paid only on the sale price of the car without the extra equipment.
- 9—The Treasury Department does not look with disfavor on the plan of averaging the tax so that the amount of tax paid by the ultimate purchaser of a certain type of car shall be the same irrespective of the sliding scale of discounts allowed various classes of dealers. The department agrees that this probably would be fairer to the retail buyer. In this connection it is pointed out that the Treasury Department is interested only in the tax which the manufacturer pays on his car sale, and not in the form in which he passes it to the ultimate consumer. It is recommended that the dealer place on his bills an amount which will cover the war tax, with the notation, "to cover the war tax," rather than to label it merely "war tax."
- 10—Although the matter is still under consideration, the Treasury Department is inclined to rule that the revenue bill as worded makes no exceptions in the case of used cars held by wholesalers on Oct. 4, on which officials think that a tax of $1\frac{1}{2}$ per cent may have to be paid, despite the fact that this is not the intention of the Conference Committee members. In other words, wholesalers or distributors doing both a wholesale and retail business may have to pay a tax of $1\frac{1}{2}$ per cent on used cars held on Oct. 4, though retailers apparently will not have to pay this tax.
- 11—Where a distributor or dealer is in doubt as to whether a tax should be paid, and how much, he should collect the maximum amount from the purchaser and inform him that any amount collected in excess of what the Government requires will be returned. In making returns of taxes manufacturers, wholesalers and retailers should list all taxable articles and pay the required tax on them. On

(Continued on page 694)

Australia Wants Alcohol Fuel

Special Committee Working for Removal of Excise Restrictions—Hopes for High Compression Engine to Use Pure Alcohol

FOR many years it has been recognized that while gasoline and even kerosene are fuels that must gradually be used up, alcohol is a fluid that can be manufactured forever. Had it not been for the potable nature of this spirit it would have been used as a cheap fuel probably a century ago or more; that it will be used as such before long admits of no argument. There are two main essentials in getting alcohol as a fuel upon the market: First, the removal of taxation and costly denaturing processes; second, organization for manufacture and distribution.

Naturally those countries with oil directly available are the last concerned with the provision of substitutes. Thus France with no natural liquid fuel has been a leader in alcohol investigation and England has done something by private enterprise. Apparently the most promising development to-day is that of an Australian committee, a report of whose proceedings appears in *The Autocar*, England, dated Sept. 29. It may be pointed out that Australia offers a particularly promising field for alcohol fuel development because the population is not dense, meaning that there is plenty of land per head, while the climate is suitable for the growing of crops of the requisite kind. Australia has a quick acting government, is entirely self-contained, is a long way from any oil field. She of all countries should have the best chance of starting an alcohol industry which could catch up to the demand for fuel in a reasonable time.

If the Australian committee are really able to proceed to the desired end, the world will be given a splendid opportunity to observe the results unhampered by confusing influences. The report from *The Autocar* follows:

Australian Alcohol Committee

To Australia falls the honor of being the first portion of the British Empire to give official assistance to an endeavor to popularize alcohol fuel and to create at an early date adequate supplies of that fuel and of suitable engines in which to use it.

The Commonwealth Advisory Council of Science and Industry, shortly after its institution, appointed a special committee to inquire into the production of industrial alcohol in Australia and the design and manufacture of engines suitable for using alcohol as a fuel. The first meeting of this Special Committee was held on April 16 of this year, and up to June 11, after which the first report of the committee was published, seven meetings had been held. The work accomplished by the committee up to that time was naturally of a preparatory and initial character, consisting mainly in the collection and consideration of information obtainable from all quarters, the consideration of the special conditions likely to affect the problem in Australia, and the formulation of a general programme of future action.

The committee promptly got into touch with various experts and scientific bodies, and particularly arranged to co-operate with the sub-committee on molasses of the Queensland State Committee and with the Alcohol Motor Fuel Committee of the Imperial Motor Transport Council, through whom certain inquiries are being made on behalf of the Australian Committee in Great Britain and in France.

Australia has been led to take up this subject by the steady and considerable increases in the price of gasoline and the prospect of at least a temporary shortage. The Com-

monwealth possesses no promising oil fields, which increases the local importance of utilizing alcohol as a fuel.

The committee classifies the main aspects of the problem as follows:

The design and manufacture of the engine.

The supply of the alcohol, including its distribution.

The denaturation of the alcohol.

The committee considers it desirable to investigate all these aspects concurrently, for the good reason that the spirit cannot be serviceable unless suitable engines exist, and manufacturers will not produce suitable engines unless a supply of spirit is forthcoming.

Engine Design

The committee was at first impressed with the idea that valuable results might be obtained by offering a prize for the best design of engine submitted in public competition. Subsequent inquiry, however, led it to abandon this proposal, in view of the fact that large numbers of successful alcohol engines have already been built. It finds that the main difficulties in the way of using alcohol in an ordinary gasoline engine are connected with starting from the cold and with the supply of adequate quantities of alcohol fuel. It estimates that in an ordinary gasoline engine the consumption of alcohol (used alone) is about 50 per cent greater than the consumption of gasoline per brake horsepower developed. It recognizes, however, that in specially designed alcohol engines the consumption of alcohol need be no higher than the present consumption of gasoline in an engine developing equal power.

The more efficient use of alcohol will be brought about mainly by increasing compression from about 75 lb. per sq. in. to about 180 lb.; by pre-heating the fuel, the air, or the mixture; and by increasing the area of the fuel jets and supply pipes. It is suggested that the starting difficulty can best be overcome either by pre-heating the carburetor or by using a small amount of gasoline at the start. Subsequently, any heating of the carburetor that may remain necessary can be secured by utilizing the exhaust gases.

Advantages of Alcohol

The committee has decided to devote its attention primarily to the design and manufacture of stationary engines rather than motor car engines. This, for the reason that the starting difficulty is not likely to be so acute in respect of stationary engines, and that experience shows that alcohol is more efficient in engines of low piston speed and long stroke. Moreover, it is considered that the problem of distribution of alcohol is not likely to be so serious in the case of stationary engines as in connection with its proposed general adoption as a spirit for motor cars.

The committee is of opinion that alcohol possesses many advantages. The products of combustion are practically odorless, and are free from smoke. The risk from fire connected with the storage and handling of alcohol is much less considerable. The possibility of using high compressions makes a very high thermal efficiency obtainable, and for carbureting purposes the fuel is unusually homogeneous. As regards Australia in particular, it has a great advantage, inasmuch as it can be manufactured in largely increased quantities in that country.

It is intended to endeavor to educate public opinion in Australia to an appreciation of the possibilities of the alcohol engine. With this end in view, inquiries have been instituted through the Secretary of the Alcohol Motor Fuel Committee, with a view to ascertaining what are the most efficient and

suitable types of engine available. The idea is either to purchase or, if necessary, to have constructed an engine or engines for demonstration purposes. These will be exhibited at work at agricultural shows and other exhibitions in the Commonwealth, and it is hoped that the result may be to induce manufacturers in Australia to turn their attention to the production of alcohol engines.

Supply of Alcohol

The committee considers that the supply of alcohol is likely to prove a much more difficult problem than the question of engine design. The most economical Australian source of alcohol at the present time is to be found in sugar molasses. If, however, the whole available supply of molasses in Australia were used for the purpose in view, it would be sufficient only for the production of about 4,000,000 gal. of alcohol per annum, whereas the annual importation of gasoline is already about 17,000,000 gal. The total average quantity of molasses available in Australia for distillation is about 50,000 tons, of which about one-quarter are now used; the remaining three-quarters are largely wasted. The present price of ethyl alcohol produced from molasses is about 42 cents per gallon ex store in Melbourne.

The committee is not optimistic as to the possibility of producing any considerable quantity of alcohol from other raw or waste material at present in Australia. The most important of these are waste timber, grass tree, prickly pear, waste fruit, and straw. The production of alcohol from waste timber or straw is costly, and the prospects in this direction do not appear encouraging, though the whole matter is under consideration.

Sources of Alcohol

Assuming that dependence cannot be placed on waste materials, special crops must be grown for the purpose. The most promising sources seem to be maize, wheat, barley, potatoes and beet. It is estimated that the yield from a ton of maize should be 100 to 104 gal. of 95 per cent alcohol. The yield from wheat is about the same, from barley rather lower.

As regards other crops, potatoes are stated to give 20 to 30 gal. per ton, beet from 15 to 20 gal., fruit from 11 to 17 gal., grass tree 15 gal., the sawdust of soft wood 24 gal., grapes 22 gal. and molasses 81 to 86 gal.

Alcohol Mixtures

Various authorities have proposed to the committee the use of alcohol in mixtures with other materials. This proposition is put forward mainly on the following ground: The mixed fuel could be used efficiently in existing engines of motor car type. An impetus might be given to the manufacture of fuels of the benzole order from coal tar. Suitable mixtures would overcome the starting difficulty, and their use would gradually lead to modification of motor car and stationary engines in the direction of the ideal alcohol engine. A steadily increasing market for alcohol would be secured, which would encourage producers to increase the supply. There are distinct possibilities in connection with mixtures of alcohol and other products by special processes.

The committee, recognizing the force of these arguments, purposes to take steps to bring alcohol, either as a mixture or alone, into general use in Australia for motor car work. It does not think, however, that the strength of the arguments is such as to justify it in changing its view to the effect that it should aim first at the adoption of stationary engines using alcohol alone, and so employing the fuel to the highest possible advantage.

The question of denaturants is always a difficult one, and the Australian Committee does not appear to be altogether immune from those difficulties with which any attempts to facilitate the use of industrial alcohol in Great Britain are hedged about. At present the standard denaturant in Australia is 2 per cent of wood naphtha and $\frac{1}{2}$ per cent each of pyridine and mineral benzene. The cost of these denaturants is just about $3\frac{1}{2}$ cents per gallon of alcohol. In order to reduce the price of the spirit as much as possible, a change in existing regulations is desirable.

The committee has been in communication with the controller-general of the Department of Trade and Customs, and has asked if an addition of 1 per cent pyridine only would be satisfactory. This change would reduce the cost of denaturants by nearly 2 cents a gallon. It appears, however, that the proposal is not acceptable to the customs authorities, though they have granted permission to the committee to obtain a small supply of spirit for experimental purposes denatured in the manner suggested.

It is clear that the committee would be very glad of any expert assistance that could be given to it in respect of this problem of a cheap and suitable denaturant.

As regards finance, the committee is not as yet powerful, though the sums at its disposal are no doubt adequate during the preliminary stages. The report, of which these notes form a digest, has been issued largely in the hope that it will lead to the receipt of communications from people who are interested in the work of the committee, and can give information which might be of service. Any such communications could be addressed direct to the Secretary of the Industrial Alcohol Committee of the Commonwealth Advisory Council of Science and Research, Melbourne, or, alternatively, could be made through the medium of the Secretary of the Alcohol Motor Fuel Committee of the Imperial Motor Transport Council, 39 St. James' Street, London, S.W.



THE illustration above shows a number of die-cast brass parts made by the Doehler Die Casting Co., Brooklyn, N. Y. They are about one-quarter actual size and are not all automobile pieces, but serve to show the possible range in this new process. The great difficulty in die-casting brass is to obtain sharp outline and homogeneity with freedom from air bubbles. It is only recently that the Doehler company has perfected the process, but it is now able to supply castings at least as perfect as its well-known white metal and aluminum products. As an example of the accuracy it may be mentioned that the gas meter gears shown require no machining whatever. The pump vane, Packard carburetor choke, magneto base and other pieces also come finished.

Troop Movement by Motor Truck

Special Troop-Carrying Motors Haul 36 Men Each—
3½-Ton Trucks Transport 24 Men—Speeds of 14 and 12
M. P. H. Maintained—30,000 Men Moved in 10 Hours

By W. F. Bradley

Special representative of THE AUTOMOBILE AND AUTOMOTIVE INDUSTRIES with the French Army

(This article has been approved by the French censor)



Ordinary automobile trucks employed to transport troops to the front

SPECIAL automobiles are employed in the French army for the rapid transportation of troops. These are Paris motorbus type chassis, with motor under the driver's feet, and a long, single-deck body carrying thirty-six men in addition to the driver and mechanic. Some of these vehicles went straight from Paris service to the war; the latter ones, while not differing mechanically, had much lighter and cheaper bodies, the glass windows, for instance, being abolished in favor of canvas sides.

A troop-carrying motorbus is not suitable for general war service. On this account the French Army authorities keep the number of special troop-carrying automobiles as low as possible, and make a call on the general service 3½ and 5-ton trucks whenever big bodies of men have to be moved.

Thus, in the French army there are two general services—transportation of troops and transportation of material. The former vehicles can only be used economically for carrying men; the latter are designed for transporting general war material, but are quite satisfactory in the troop-transportation department whenever, and this occurs rather frequently, the special vehicles are not sufficient to meet all requirements.

Long before the war clouds formed in Europe it had been decided that on general mobilization being ordered the Paris buses should pass over to the War Department as troop-carrying or fresh-meat vehicles. This change had been rehearsed so often in manœuvres that when the storm broke the transformation took place quite normally, the Paris buses being the first fleet of automobiles to go into war service. The knowledge that the vehicles might, on some vague date, have to become a part of the army service undoubtedly influenced design, and explains why the Paris buses were heavier than those in use in some other European cities, particularly London. For their own class of work, carrying loads not often exceeding 2½ tons, this type of vehicle has proven very satisfactory under the stress of war. Proof of this is found in the fact that after 3 years hard war service, during which time they have never been sent away from the front, hundreds of these vehicles are giving as reliable service as the day they went out of Paris.

There are two types of bus chassis, one built by De Dion Bouton, the other by Schneider. While details differ considerably, general features are the same. The De Dion Bouton engine is a separately cast four-cylinder of 110 by 150 mm., developing 30 hp. at 1000 r.p.m. The

Transportation Methods Used by French Army Along the Battlefront



Above—French troops getting aboard automobile trucks at railroad stations



Left — Transport material section used for bringing up reserve troops. Each truck in this section has a cogwheel as its distinctive sign



Left — Transport material truck bringing up reserve troops. Note horse vehicles on sidewalk and one-half of road maintained free for passage of troops

Below—A convoy of Pierce-Arrow trucks designed for transporting material, but often used for quick removal of troops



engine is thermo-siphon cooled with the use of a special circular copper tube radiator surrounding a centrifugal fan. The entire system of tubes is mounted in a sheet steel casing; the centrifugal fan runs at a lower speed than the usual propeller fan and is more efficient, while dust is not drawn in onto the motor. Forced feed oil lubrication is applied to all motor parts.

Circulating Splash Oil System Used

The Schneider motor is also a four-cylinder of 125 by 140, with superimposed valves, the inlets being operated by pushrods and overhead rockers from a single camshaft with keyed-on cams. Unlike the De Dion, a circulating splash oil system is used. The motor is governed to 900 revolutions, at which speed it develops 30 hp. Both makes of chassis have three speeds and reverse, with final drive by internal gears, and are devoid of torque and radius rods. The gear ratios give a road speed of 14, 8 and 4 m.p.h., and 2.7 on reverse.

The wheelbase of the troop-carrying car is 175 in., but the total chassis length is 298 in. Rear width is 86 in., and over the front axle caps 81 in. The body length necessary for passenger carrying service is obtained by placing the driver over the motor and by a rear platform lower than the main frame. A subsidiary frame is built laterally on the main frame, so that the body is equal to the width between hubcaps. The chassis weight is 7200 pounds and total weight in running order rather more than 11,000 pounds. This represents the weight of the vehicle as originally designed for city service. For war work interior fittings can be simplified considerably by such means as the abolition of window frames, partitions, wood panels, etc., making an appreciable reduction in weight. The live load is higher, however, for while a city passenger carries no baggage, a soldier is heavily loaded. Thus, full loaded on war service the total weight of the bus is not less than 17,000 pounds.

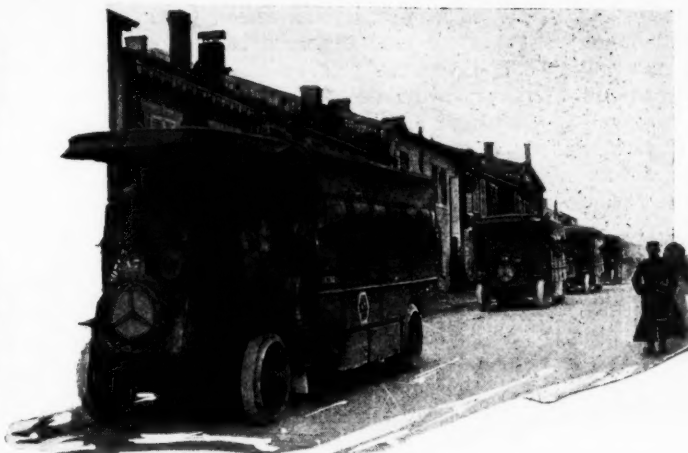
Paris Buses for Big Troop Movements

When big troop movements are under contemplation, the first call is made on the former Paris bus vehicles. Next the ordinary transport trucks are brought into service, and as the ratio between the two is at least 1 to 20, in any big operation it invariably happens that ordinary trucks on troop-carrying work outnumber the special vehicles.

The troop-carrying buses take a load of 36 men; a 3½-ton truck with a couple of seats placed longitudinally cannot handle more than 24 if the haul is of any length and the comfort of the men has to be considered. Taking the average weight of the men, with kit, as 180 pounds, the live load is less than 4500 pounds, and is obviously below the efficiency load of the vehicle. However, this is a problem not of weight but of space. With a view to increasing the load, trailers have been employed behind ordinary trucks. Many 5-ton Pierce-Arrow trucks have been used in this way, the load being increased to 40 men with a solid-tired two-wheel trailer. The experiment has not given complete satisfaction, it having been found that the addition of a trailer causes the truck to work too near its safety limits and results in a general deterioration, although the truck on which the experiments have been carried out is undoubtedly one of the best. On this account the use of trailers behind ordinary trucks is more or less occasional.

Transportation by Automobile Extensively Developed

Infantry transportation by means of automobile trucks has received an extensive development on all parts of the French front. Men returning from leave by railroad,



Transformed Paris motorbuses transporting troops to the front

and deposited at the terminus station, which, owing to the enemy fire, may be from 5 to 12 miles from their quarters, are not allowed to make the journey on foot. Outside the railroad depot a big poster orders the men to group themselves before a letter or number representing their particular camp or quarters. The men wait there until an automobile, either an ordinary truck or a special troop-carrying vehicle, picks them up. It is found more economical to run an automobile service than to allow the men to come up on foot and without control. In the latter case they are apt to stray or to loiter on the road.

After a period of duty in the trenches men are brought to the rear by automobile. The service provides for the carrying of fresh troops to some point behind the trenches, the distance depending largely on topographical conditions, then the return of the tired troops to the quarters prepared for them in the rear. In the case of an important attack, or when preparations have to be made to drive off an enemy attack, troop-carrying automobiles are used on an extensive scale. Occasions are comparatively common when the automobile service has been instructed to transport an army corps of 30,000 men within a period of 10 hours.

Has a Speed of 14 M.P.H.

The special troop-carrying automobiles have a speed of 14 m.p.h., whereas ordinary trucks are not usually run higher than 12 m.p.h. It is possible, however, to estimate on a commercial average of 10 m.p.h. for troop-moving operations under normal road conditions. The length of trips in moving troops from point to point varies from 20 to 40 miles. To take one specific example, when the Germans were making their great attacks on Verdun, in the early months of 1916, all fresh troops were brought from Bar-le-Duc to Verdun by means of automobile trucks, a distance of 35 miles, making 70 miles for the round trip. With the use of 1250 3½-ton trucks 30,000 men could be taken to the front in just under 4 hours actual time. With 625 trucks the same number of men could be carried in 14 hours.

By the use of special troop-carrying automobiles, taking 36 men aboard each, a fleet of 840 is sufficient to carry 30,000 men a distance of 35 miles within 4 hours. While fleets of 840 troop-carrying automobiles are available, it usually happens that when an army of 30,000 men has to be handled in a limited space of time the convoys are a mixture of ordinary trucks and troop-carrying vehicles.

On trips to and from the front it is not often that a distance of 40 miles is exceeded. Under this distance

railroads are apt to be precarious, owing to enemy bombardment; but beyond this distance rail transportation can always be counted on. There have been numerous occasions, however, when the Allies in France have had to move big bodies of troops parallel to their front, in a direction at right angles to all the main railroad lines. Under such conditions the automobile service is supreme, by reason of its greater elasticity. Also when these movements have to be made the distance covered on a single trip will run as high as 100 miles.

It has been found impossible to move big bodies of troops by automobile without a very efficient traffic control system. The French adopt what they officially designate as the guarded-road system. Under this the route to be followed by the convoys is marked off into cantons of about 6 miles in length, each canton being under the direct control of a traffic squad, and every squad being in telephonic communication with the others.

Travel in Five-Truck Units

Although the units on the road are a section comprising 15 to 20 trucks in charge of a lieutenant, traffic conditions necessitate these being split into sub-sections of 5 trucks, which are considered by the traffic squad as a train, and consequently indivisible. The five vehicles of a sub-section remain always in close convoy formation, but a distance of 50 yards is invariably maintained between the respective sub-sections. If the sub-section ahead stops or slows down the one immediately behind must do the same, so as to preserve the regulation 50 yards gap. As a guide to the drivers, the last truck of each sub-section carries a red disk emerging above the top of the body.

The system adopted is practically the same as the block system used on railroads. The traffic squad has entire responsibility on the length of road entrusted to them, and in case of a breakdown or an accident it is up to them to get the obstruction out of the way, even to the complete loss of the truck if no less drastic remedy is available. Under such a system the departure and arrival of fleets of automobiles running into a few thousands can be relied on with mathematical accuracy. According to general conditions a guarded road will be used for one or two-way traffic, and for all automobile or a mixture of automobile and horse vehicles, to the exclusion of cavalry or troops afoot. Where the highest efficiency is desired, the road is barred to everything but mechanical traction.

Wonderful as are some city traffic-control systems, they are less remarkable than the control exercised on military roads at the front. Obviously there can be no question of the willingness or otherwise of the individual drivers to obey the regulations drawn up. The traffic squad has undisputed authority, while obedience to the regulations may be the essential condition of the personal safety of the men. In villages, at cross-roads, at the approach to bridges, which are probably of a temporary nature and frequently under fire, numerous direction posts are erected for the benefit of drivers, and at most of these places a special traffic man is permanently on duty. Small French towns and villages are invariably twisted and complicated, so that the only way to avoid loss of time and a general hold-up of traffic is to mark off through routes for the different destinations and the different types of traffic, and to show these routes by means of big boards placed at frequent intervals.

Groups Carry Distinctive Signs

As a matter of recognition each group of 45 to 57 trucks adopts some distinctive sign—a couple of peasant children under a big umbrella, a cock within a cog-wheel, a hare and a tortoise, etc. As four groups are

united into a groupment for matters of administration, repairs, etc., the same sign is adopted for all four with different color combinations. Thus the design indicates the groupment, and the combination of colors tells to which of the four groups any particular truck belongs. This is in addition to the number given to each truck in a section and the general army number carried by every automobile at the front. It is also in addition to the red disk carried at the rear of every fifth truck when operating on a guarded road in close convoy formation. A number is always difficult to remember, while a distinctive sign tells a driver or officer immediately whether he is in the presence of one of his own trucks or a stranger.

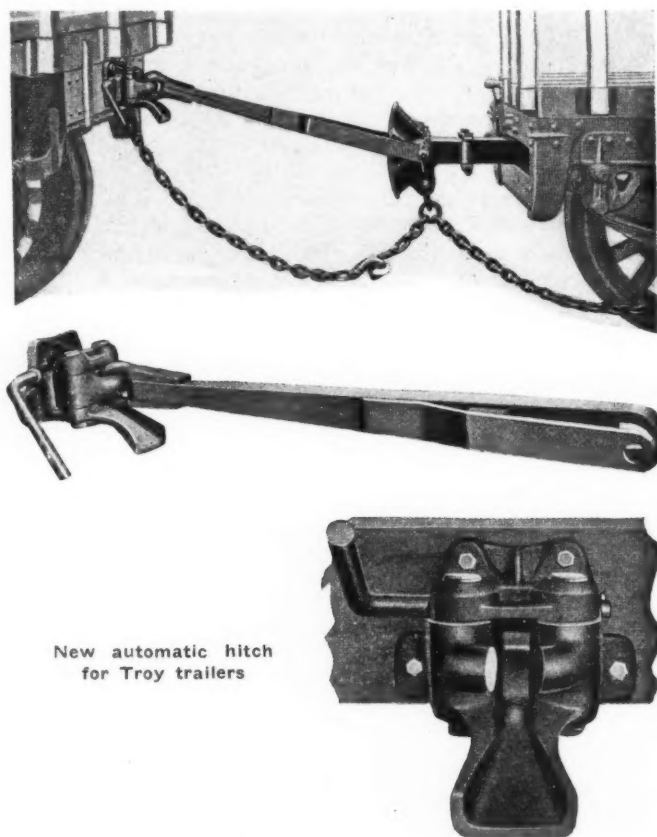
Automatic Hitch Troy Trailers

A NEW automatic hitch for trailers has been announced by the Troy Wagon Works Co., Troy, Ohio. The coupling is made automatically. All the operator has to do is to raise the hand lever and part the jaws, then steer the connecting bar into the apron of the hitch, which will guide it into the jaws and trip the lock, so that the coupling is made similar to that of the ordinary railroad car.

This arrangement permits the coupling to be made without the operator going between the truck and trailer, for he can stand to the side and guide the connecting bar into the apron of the hitch by means of a stick, and from any angle, thereby avoiding the possibility of getting caught.

When the coupling is made, as the jaws close in front they open in the rear, which allows the hand lever to drop and throw a lug between them, so there is no possible way for the jaws to open and release the connecting bar until the hand lever is raised by the operator. To uncouple, the operator simply raises the hand lever and the truck pulls away.

One change has been made in the hitch, as shown by the illustration. Instead of having to drill the truck frame, the large casting is now made longer and three holes bored at the bottom, so that the bolts will straddle the frame. This makes the hitch adjustable to any width frame and it can be changed from one truck to another very quickly.



New automatic hitch for Troy trailers

Purchasing Agents Will Co-operate

Pittsburgh Convention Evidences New Spirit—Association Has Tripled Membership in Year—Convention Approves Standard Catalog—Rapid Future Development Expected

By J. E. Schipper

PITTSBURGH, Oct. 11—A new era of co-operation among the buyers of the country has been ushered in by the convention of the National Association of Purchasing Agents which closed here to-day. This movement, which is about 2 years old from a national standpoint, has taken a firm root and is extending with almost unprecedented rapidity over the country. Branch associations are springing up in every city of industrial importance throughout the United States, and it is very probable that between now and October, 1918, the combined activities of purchasing agents will have extended themselves 1000 per cent.

The membership of the National Association of Purchasing Agents a year ago was 200. It has tripled during the year, and with the coming alliance of a great many independent buyers' associations in various centers throughout the country it is probable that in another year there will be from 1500 to 2000 members. National movements in the way of the standardization of catalog sizes, the standardization of contracts, an exchange bureau where purchasing agents who are over supplied with a certain kind of material can turn this over to others needing it, and various other activities of value to those who buy for industrial and manufacturing concerns are well under way.

Approve Standard Catalog

Probably the most direct point of accomplishment at the Pittsburgh convention, at which there was an attendance of 400 members, was the adoption of the 8½ x 11 in. size as a standard catalog. This is subject to the approval of the directors up to Jan. 1, 1918, giving those in the industrial field an opportunity to file their objections to the size before that time. The size, 8½ x 11 in., was chosen because it is standard letter size and easily and conveniently filed. It is very probable that the association will fix some time in the future after which it is expected that catalogs will be made to the size accepted, to the mutual advantage of both buyer and seller, and with the result of the elimination of a vast amount of wastage resulting from the scrapping of costly catalogs.

The convention was taken up to a considerable extent by internal affairs of the organization, but these are of tremendous importance in view of the fact that the changes made in the organization itself have so broadened it as to eliminate any objections for independent bodies, representing other industrial centers, from associating themselves with the national organization.

The National Association of Purchasing Agents now stands upon a broad foundation, and the prospects for its growth are so evident that the industrial world should keenly realize the effects that this organization

of buyers, standing for the purchase of billions of dollars' worth of materials a year, will have. This combination will work for scientific buying, conservation, and high ethical standards in an effective manner, and the great industrial importance of the organization of salesmen will be repeated on the buying side of the fence to the same degree of importance.

The officers elected at the Pittsburgh convention were E. L. McGrew of the Standard Underground Cable Co., Pittsburgh, president; N. O. Abey of the Jeffery Mfg. Co., Columbus, Ohio, first vice-president; Charles P. Kingston of John Brennan & Co., boiler manufacturers, Detroit, second vice-president; W. B. Goldes, Philadelphia, third vice-president; W. T. Hall, New York, treasurer; L. T. Boffey, editor of *The Purchasing Agent*, secretary.

In addition to the officers, committees have been appointed on the standardization of catalogs, employment, credit, and an exchange bureau of materials.

Show Date by Color

The papers presented at the meeting were of professional interest to the buyers. W. L. Chandler of the Dodge Mfg. Co., Mishawaka, Ind., opened the discussion on the standardization of catalogs, and it was largely as a result of his work along these lines during the past year that the recommendation for the standard 8½ x 11-in. sheet was adopted. A great many suggestions were offered in addition to the size of the sheet; for instance, a system of indicating obsolete catalogs by using standard colors for each year so that the purchasing agent on referring to his catalog files could tell the age of the catalog immediately by a glance at its color. If the color indicated, for instance, that the catalog was 3 years old, he could write the concern which issued it and find out from them if this is the last that has been issued. If so, he can put an O. K. tag on of the proper color, indicating that the catalog was up to time on that particular date. It was pointed out that the use of the standard size and standard color need not in any way interfere with the originality of the catalog itself. The publisher of the catalog would be at liberty to use any quality of stock and make full use of the arts of typography and make-up in his catalog. The idea is enthusiastically favored by purchasing agents, and no doubt the adoption of this size sheet by the National body will carry considerable weight in the future.

W. G. Langford of Westinghouse, Church, Kerr & Co., New York City, read a paper entitled "Policy in Buying." His paper was largely concerned with the ethics of buying, as well as with the systems which should be employed in securing quotations. One of the points

which he emphasized is that the purchasing agent should keep a keen eye on office system and should welcome a free exchange of ideas among other purchasing agents telling of office systems in use and the forms employed.

Mr. Langford emphasized the value of competitive bidding, but stated that a bidder who has been perpetually unsuccessful should not be allowed to become discouraged, but should be called into conference and told why his bids are not successful. He stated that confidential quotations should by no means be disclosed to other sellers, but in the case of the unsuccessful bidder who did not seem to be able to meet the terms of a competitor, he should be shown a list of bids made by other concerns with the name of the concern bidding left off.

One of the points brought out by Mr. Langford is that there can be generalship in buying without resorting to methods which may be called tricky. He stated that a repeat salesman should be as welcome to the buyer as a repeat buyer is to the salesman; also that the buyer should study the salesman as well as the salesman should study the buyer, and strategy should not be carried to a point where it becomes sharp practice.

A great many of the rules of salesmanship can be inverted to some extent and applied to the buyer. Other rules which have been found in the latest schools of salesmanship to be successful with salesmen are also successful with buyers. For instance, it has been noted by responsible concerns that it is not necessary for the salesman to have personal contact with the buyer. In the same way the larger concerns are realizing, and the biggest buyers know that there is no necessity for having personal contact with the salesman to whom an order is given.

Do Not Antagonize Salesmen

Mr. Chandler stated that the buyer should never arouse animosity in the salesman, but should always be fair in dealing and allow cold facts alone to determine a purchase. Every salesman should be given a show to secure an order, and the purchasing agent must be able to turn down his best friend if necessary. Another point in the paper by the same author was the fact that the purchasing agent should keep in close touch with broad buying subjects, such as markets, sources of supply, improvements in methods of manufacture, methods of determining quality, and kindred subjects.

Some interesting thoughts were brought out in a paper by F. A. Marsh of the Link Belt Co., Chicago. His paper was entitled "Cash Discounts as Viewed by the Purchasing Agent." One of the facts stated by him is that cash discounts are often given by a weaker concern because of the necessity in securing quick

payment, due to lack of liquid assets. He stated that the purchasing agents should take advantage of such discounts because it would even pay to borrow money at standard rates of interest in order to pay the bill, when these discounts are offered. Another fact which he stated that the purchasing agent should study is that in the case of the purchasing agent placing large orders, the price which he will be able to secure will often depend upon the credit of the concern for which he is working. With a concern having a weak credit a large order is very apt to mean a high price, whereas with a concern having a strong credit a large order generally means a lower price. In order to make the price conform to the best market, the size of the order should often be made to coincide with the state of credit of the concern from which the purchasing agent is buying. Thus the matters of cash discount and credit are closely related. The purchasing agent of known honesty, backed by a concern of known credit, is in the most advantageous position as far as buying is concerned.

Function of Traffic Department

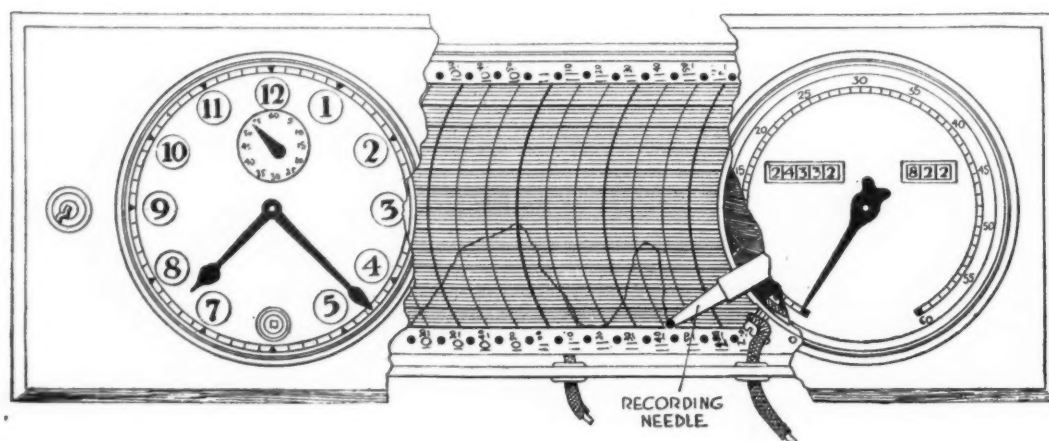
H. E. Marmon of the Pittsburgh-Des Moines Co. gave a discussion of the relation of traffic and purchasing departments. This was participated in by several of the members present. The discussion hinged about the point as to whether or not the traffic department should be subordinate to the purchasing department. Paxton Mendelssohn, purchasing agent for the airplane division of the Fisher Body Corp., Detroit, stated that a solution for this problem has been worked out in the Fisher plant. The traffic department is under the supervision of the purchasing department on inbound freight, while on outbound freight it is under the supervision of the production department. Thus the purchasing department has the responsibility not only of buying the materials, but of seeing that they are delivered to the production department, while the production department has the responsibility of not only getting out the finished work, but of seeing that it is carried properly to its destination. Some of the members present felt that the purchasing agent had enough to do in his own particular department without attempting to take up the details of traffic work, but the general feeling was that some of the broader problems of routing and other traffic matters should be subjected to the wishes of the purchasing agent.

Speedometer and Clock Record All Motion

A DEVICE providing a continuous record of every movement of a car has recently been patented by C. J. Welch, 200 East Grand Boulevard, Detroit, and plans are now under way for its production.

In brief, it comprises a strip of paper, divided vertically into days, hours and minutes, horizontally into miles per hour, and moved by clockwork beneath a pencil that is attached to a secondary speedometer needle. The mark left by the pencil on the chart shows the speed at which the car was traveling at any time.

Any type of dash clock, or speedometer, can be adapted.



Hardness and Hardening*

Definitions and Measurement of Hardness—Different Methods of Hardening Metals—Relation Between Hardness and Wear

By Prof. T. Turner

IT has been frequently stated that hardness is a property which cannot be measured or readily defined. This is merely another way of saying that we have not made up our minds as to what we mean by the term "hardness," for there is little difficulty in framing a definition when once a clear mental conception is reached. That which can be accurately defined is capable of measurement.

Though so eminent an authority as the late M. F. Osmond has used the word "measurement" in connection with hardness tests—see report *Sur la Dureté: sa définition et sa mesure*, Paris, 1892—physicists appear to have pretty generally expressed the view that hardness cannot be measured. Professor H. Le Chatelier, in discussing the "Report of the Hardness Tests Research Committee" (page 777), admirably states this view as follows: "Two simple characteristics determined whether a quantity might be measured or not. If measurable, it should satisfy the laws of equivalence and accumulation. Temperature, though it followed the law of equivalence, did not follow that of accumulation. For instance, two bodies raised to the same temperature would not give a higher temperature if brought together. So that temperature could not be measured—all that could be done was to register it on certain scales. . . . Hardness was exactly the quantity which followed neither the law of equivalence nor that of accumulation."

It may be dangerous for one who can make no claim to be a physicist to differ from so recognized an authority as Professor Le Chatelier. On the other hand, it may be inconvenient to take words which have been familiar for centuries, and to endeavor to limit their application to the specialized uses of modern science. In the present instance it may be pointed out that a property is not necessarily a quantity; and it would scarcely be urged that hardness is a quantity in the sense of the physicist. Further, it may be remembered that the word "measure" has a much wider use in our language than is suggested by the laws of equivalence and accumulation.

A Numerical Scale Required

What we require for practical purposes, is to be able to register hardness on a numerical scale, just as we do density, tenacity, viscosity, or other properties. For example, we determine relative density; it does not follow the law of accumulation, because if two bodies of the same density are brought together the density is not doubled—unless they are gases which can be compressed into half their original space. The determination is accurate, and similar results are obtained on repetition. Shall we say the density has been measured; or has it only been registered or determined? To the physicist the choice of a word here may be important. But the ordinary reader might be misled if he were told that the density, or the elastic limit, of a metal cannot be measured.

The definition which I myself prefer is that hardness is the property whereby a body is able to penetrate another body; and conversely, it is the property whereby a body resists being itself penetrated. This does not materially differ from the definition proposed by M. Osmond in 1892, that hardness is "resistance to permanent deformation." Sir Robert Hadfield's definition is simply "resistance to deformation." From the mechanical aspect, hardness, as so defined, will closely correspond with the "yield point" or "breaking-down point" of the material. In ductile materials, such as

relatively pure metals, of which mild steel is an example, the yield point is often roughly proportional to the ultimate tensile strength. In such cases the hardness, as measured by the stress per unit of area required to produce penetration, is less than, but varies with the tenacity. In brittle materials the yield point and the ultimate strength are practically identical: in such cases tenacity and hardness will nearly coincide. The hardness may, however, exceed the tenacity, since in a tensile test the particles are drawn away or separated from each other, while in a penetration test there is a certain amount of "backing" in the material, which tends to support the penetrating body.

With penetration tests, such as those of Brinnell, in which an appreciable quantity of metal is displaced, the true hardness is not obtained, since the displaced material becomes more or less work-hardened, and another similar test on the same spot will not give the same result. The difference may, however, not be large. In wearing tests the polishing, and consequent hardening, of the rubbing surfaces on the one hand, or their disintegration on the other, may lead to quite erroneous conclusions. Theoretically, the production of a scratch of standard width, and of indefinite thinness, with the employment of an ascertained weight, would appear to most nearly meet the ideal conception. For practical purposes the requirement of a smooth surface, and the difficulty of accurately deciding the character of the scratch, has prevented the extensive use of scratching tests by engineers, though such tests are still preferred by mineralogists and other workers. The conception underlying the Brinnell test is a simple one—namely, that a unit of surface will just maintain a stated pressure before being deformed. So long as the amount of deformation of the sample is not excessive, and provided the body to be tested is not brittle, the Brinnell hardness number closely corresponds with true physical hardness.

Resistance to Wear

For many purposes, however, the engineer does not really require hardness, though he asks for it. What he does desire is resistance to wear, or to deformation, or some other property or combination of properties which are of importance for the particular purpose he has in view. Thus, if we consider a wearing or grinding test, it is necessary, if the metal is not to wear away quickly, (1) that the particles on the surface shall not be readily displaced, and (2) that the particles so displaced shall not be readily removed. Both conditions are necessary; either alone is not sufficient. Substances which are really hard do not permit of their particles being readily displaced—hence they wear well. Plastic metals do not permit of their displaced particles being readily removed—hence they, too, may give good wearing surfaces, though they are really very soft. The wearing properties of manganese steel, for instance, would appear to be due to two causes: (1) The relatively high natural hardness of the material itself; (2) the fact that the particles which are displaced from the surface do not come away and form a powder, but are plastically spread over other parts of the surface; they are thus capable of being repeatedly displaced, and are work-hardened before being ultimately lost.

A number of unfortunate terms have been introduced during the last few years, such as "tensile hardness," "wearing hardness," "elastic hardness," and so forth. These terms are misnomers. Thus tensile hardness is merely tenacity; but tenacity indirectly measured by some apparatus which is

*Paper presented at the September meeting of The Institute of Metals. Slightly abridged.

found to give results which, when multiplied by a suitable factor, are approximately the same as those obtained by the tensile testing machine. This term has been almost exclusively used in connection with tests of mild steel, such as is used for constructional purposes and for somewhat harder material as employed for rails. In such cases, as has been already pointed out, the true hardness is less than, though approximately proportional to, the ultimate tensile strength.

Hardness of Pure Metals

If attention were confined to the pure metals in their cast, annealed, or unwrought condition, the question would be much simplified, for the hardness varies inversely as the atomic volume. In other words, the hardness increases as the number of atoms in a unit space increases. S. W. Smith has also shown that with liquid metals surface tension varies inversely as some function of the atomic volume, while Dr. F. C. Thompson suggests that the elastic limit is dependent upon surface tension. Dr. Tutton has shown that with a number of substances other than metals, the hardness varies as the molecular volume, provided always that similar materials are compared. Dr. Tutton has also pointed out that it may be anticipated in crystallized substances, owing to the arrangement of atoms in the crystals, there may be some differences of hardness in different directions in the same crystal.

It is frequently stated that pure metals are not to be obtained commercially; but it is worthy of remark how exceedingly pure some commercial samples of metal really are. Thus lead, tin, and zinc are sold by the ton with an analysis which shows 99.95 per cent of the respective metal, and only one part in two thousand of total impurity. But for the majority of purposes pure metals are too soft, and must be hardened in some way.

Methods of Hardening

There are three methods whereby the hardness of a pure metal may be increased: (1) by alloying; (2) by cold working; (3) by chilling.

Chilling may be regarded as a combination or variation of the first two methods. It may lead to the setting up of internal strains, which really produce the effect of cold work; or it may change the chemical composition of an alloy by causing some constituent to remain in solution, or even prevent a constituent from going into solution. The hardening of steel, and the softening of certain bronzes, by chilling, are examples of this effect on internal composition. Ultimately, therefore, metals or alloys can only be hardened by a change of composition or by strain.

When we add to one metal another metal, or other element, and allow the product to solidify, the result is a mixture, a compound, an eutectic, or a solid solution. The useful ductile alloys are, almost without exception, solid solutions. Since this fact has been recognized special attention has been given to the nature and properties of metallic solid solutions, and some important generalizations are now fairly well known.

Hardness of Solid Solution

As we pass from either end of a series of solid solutions toward the center of the series it will be found that the hardness, the limit of elasticity, and the tensile strength increase, but the ductility—as measured by the extension and the reduction of area—and the electrical conductivity decrease. The melting point usually changes fairly regularly throughout the series. These facts for a series of solid solutions of a metal A, and any other metal, metallic compound, or non-metal B, which forms a series of solid solutions with the metal A, may be diagrammatically represented in the simplest possible manner.

If a series of solid solutions be interrupted by the presence of compounds, or of eutectics, these will be indicated by irregularities in the hardness and other physical properties, at such points as correspond with the end of the series in the respective cases.

It will thus be seen that it is possible to harden either constituent by addition of moderate proportions of the other. At the same time the material becomes less ductile—in other

words, more brittle. A point is frequently reached at which the tenacity can no longer be increased with safety, owing to the continued increase in brittleness. But the metals we add do not necessarily diminish the ductility in their alloys at the same rate as they increase the tensile strength. For example, nickel, copper, manganese, or chromium may be added to steel in such proportions that the improvement in tenacity is much greater than the deterioration in ductility. Hence the application of such metals, in suitable proportions, in steels for special purposes.

In the copper alloys the same general principles are adopted. The proportion of zinc which can be added to copper, in order to strengthen it, is limited by the loss of ductility, having regard to the purpose in view. For ductile bronzes, as is well known, the limit of zinc is usually about 30 per cent. Small quantities of iron or of manganese may increase the tenacity more rapidly than they deteriorate the ductility. Of this we have examples in the manganese and iron bronzes.

It is stated in the "Ninth Report of the Alloys Research Committee"—page 133—that the effect of adding manganese to an alloy of copper and aluminum was to raise its yield point and tensile strength without reducing its ductility to a corresponding extent. With increased knowledge of the effects produced by relatively small additions of the less common metals to our alloys, it is probable that a useful field will be opened for increasing their hardness without producing brittleness.

Hardening by Cold Work

Turning now to the hardening of metals by cold working, it is well known, to those interested in the wrought metal industries, that the effect of such processes upon the mechanical properties of many metals and alloys is remarkable. The yield point and tensile strength are raised, while the elongation and reduction in area—or ductility—are markedly lowered. The electrical conductivity is only slightly affected. Further work put upon the metal causes it to fracture. By suitable annealing the material may be rendered soft and ductile as before. The material in its wrought state not only has greater strength, but is also harder than the original metal or alloy. But when that hardness is measured by different instruments, such as the sclerometer, the scleroscope, or the Brinnell tester, it is not found that the values obtained are in agreement. Hence the hardness produced by cold working is different in kind from that resulting from the alloying we have previously discussed.

It might, perhaps, be assumed that rolling, hammering, or pressing a metal would render it more dense, and that the observed increase of hardness is due to such added density. But any change of density due to mechanical processes is far too small to permit of being explained on the principle of atomic volume. Further, as a matter of fact, the change is ultimately in the opposite direction. The first result of pressure is to close up any pores, cracks, or blow-holes, and thus to increase the apparent density; hence bars are usually more dense than the ingots from which they have been rolled. The subsequent effect of cold working is to slightly but appreciably diminish the relative density of the worked material. It is important to consider how this change is brought about.

If a piece of metal be stressed to any extent below its elastic limit, and the stress is removed, the metal returns to its original form and volume, and no hardening results. But if the stress be increased, so that the elastic limit is passed, permanent stretching or strain results, and the metal becomes worked hard. This stretching or deformation occurs, as has been shown by Rosenhain and other workers, chiefly, if not entirely, by shearing slip along planes of internal crystal symmetry. It matters not whether the force be applied in the form of a pull of a tensile machine, a blow as from a hammer, or pressure as in a compression test; there is no hardening unless there has been shearing flow, and this flow generally, if not universally, results in a small but appreciable diminution of density. We may profitably inquire how this change of density originates.

Cause of Work Hardness

If we imagine a solid crystal which is under strain, as a result of which shear occurs along a plane of crystal symmetry, it will be evident that at the moment the particles are

pushed asunder, and caused to slide upon each other, they were clinging to each other, and were separated only with difficulty, and by what we usually call a "pull" of sufficient strength. The materials thus clinging to each other, and forcibly separated, were in a state of tension. It would, therefore, appear that the intervening layer of "amorphous" material cannot be in a normal or unstrained condition, neither can it be in compression; it must, therefore, be in a state of tension. When a bar of metal is in tension it becomes longer, and the extension is proportional to the stress applied. But in such a case the bar becomes thinner as it elongates; so the extension must not be regarded as indicating any volume change. Yet doubtless there is a small, but nevertheless real, volume change when a bar is stretched or compressed. It is just as real as the expansion of a gas on reducing the pressure, though almost indefinitely smaller in amount. It is this volume change, due to tension, which leads to the observed diminution of density in wrought metals.

That diminution of density does result from cold working has been shown experimentally by many observers. Thus Brunton found that in drawing steel wire its specific gravity could be increased from 7.768 to 7.998 by cold work, but that when this point was reached further drawing caused the density to decrease. Kahlbaum has shown that the density of platinum wire is reduced from 21.43 to 21.41 by wire drawing. Lowry and Parker found that metallic filings are in a worked hard condition, and that by annealing their density increased. Professor Lea, of Birmingham, has found that the density of mild steel is diminished if it be subjected to compressive stress which leads to distortion. Lastly, it may be recalled that Professor Heyn, in his May Lecture, has proved that in cold-rolled bars the outside is in tension and the inside in compression.

Hardness and Tension

When steel, which contains carbon, is hardened by means of rapid cooling, it is well known that the density of the hard steel is less than that of the soft or annealed material. Hence Prof. J. W. Langley suggested the hypothesis that hardness corresponds with a condition of internal tension, and softness with the absence of tension. H. E. Field, a little later, suggested that the hardening of iron is due to the particles being forced and held farther and farther apart, whether by heat or mechanical means. W. Metcalf, in discussing Field's paper, stated that cold working reduces specific gravity, while it increases the hardness, tensile, transverse, and torsional strength. He has also proved by actual measurement and weighing, on a commercial scale, that the density of cold-rolled wrought iron bars was less than that of the original metal.

These tests were conducted at Messrs. Jones and Laughlin's works when Mr. Metcalf was acting as assistant to Major W. Wade. Specific gravity tests showed that the cold-rolled iron was less dense than the hot-rolled bars. Major Wade was so surprised with the results that he arranged for a number of samples to be weighed, without vouchsafing any reason. Mr. Metcalf's results agreed with those of Major Wade, but they were so contrary to what was then the general theory that further tests were made. Hot-rolled bars were pickled, cleaned, carefully measured, and the cubic contents calculated. They were then cold rolled and carefully measured, when it was found that the increase of length more than compensated for the reduction in diameter. Many similar examples could readily be found.

Films in Tension

The conception of stretched layers existing between the particles of a cold worked metal, or at the surface of a polished metal, has led various thinkers, and especially our President, Sir George Beilby, to recognize the similarity which must exist between such layers, and the surface tension with which we are familiar in liquids. This surface tension leads to the formation of so strong a skin upon water that a fly can walk upon it, or a greased needle float. But it would be unwise to assume, because there are some obvious similarities, that, therefore, all the laws which are applicable in the one case are equally true in the other.

It is evident that if a membrane is to be stretched there must be some body to which it can be attached, or to which

it can adhere. The head of a drum is an illustration of this fact. In the case of a liquid drop the skin extends all around; but in other instances the film support is supplied by the sides of the containing vessel. It is interesting to inquire how the planes can remain stretched in a solid body, such as a cold worked metal.

If we could imagine the extreme case of the whole of the crystalline material being converted into the amorphous state, and all the planes being parallel to the length of the body, we should have an impossible condition, since all the layers would be in extension, with nothing to keep them extended. This could only exist with a body acting under external tensile stress. Such a body would be incapable of shearing strain; its yield point and its ultimate stress would coincide; it would be brittle like glass. Glass is brittle because there are no planes of shear. But in the case of a metal or alloy consisting of mixed crystals, differently oriented, strain leads to the production of a series of slip planes in each crystal aggregate. Adjoining areas, as viewed in a microscopic section, have their planes at various angles to each other, owing to the different arrangement of the component micro-crystals in each crystal aggregate. These planes, or thin films of amorphous material, may be regarded as being held in tension either by the rigidity of the crystal envelope—or cement—or by the mass of the unchanged material, or by both of these. But in ordinary mechanical processes, such as rolling, hammering, or drawing, we have not to deal with a single deformation, and one set of shearing planes in each crystal grain. Deformation follows deformation, and planes are set up in many directions. These slip planes cross and recross each other, their direction being limited only by the necessities of crystal symmetry. A section thus shows a network of crossing lines, each of which we assume to correspond with an extremely thin layer in tension. We have in such a section an intricate network, which is held together by tightly stretched strings or tapes, and supported by intervening, unaltered crystalline material. When we remember the great strength of a lattice girder, or of woven wire, we can more readily understand how these extremely thin layers or amorphous material, all of which are in tension, are able to confer great tenacity and hardness upon a worked ductile metal. The fact, referred to by Rosenhain, that metal which has been hardened against tension is softened against compression, is entirely in harmony with the foregoing explanation. But since the whole of the crystalline material never is, and never can be, completely converted into the amorphous condition, it follows that there must be unequal hardness and unequal tenacity throughout the various portions of the worked hard material.

Herein lies the essential difference in the character of the added hardness which is conferred by alloying and by cold working respectively. In the case of alloying we deal as a rule with a solid solution, which as a result of osmotic pressure is in a state of molecular tension, and every unit of which is of similar composition. It is true that with castings "coreing" occurs, but that does not really affect the argument. With a solid solution various methods of testing hardness should give results which are in general agreement. Worked hard metals, on the other hand, are less uniform in hardness, and if tested in various ways may give different results, depending upon the character of test selected.

Limits of Work Hardening

It may be of interest to consider to what extent a metal may be hardened, or have its tenacity increased, as a result of cold working. It is difficult to suppose that any means could be found whereby the tenacity of a film of metal could be made to exceed the tenacity of a thin polished film at the surface—that is to say, to exceed the surface tension. Now Quincke calculated the capillarity constant of certain solid metals per square millimeter. With iron, silver, and gold the ratios of the hard to the annealed state were about 3 or 4 to 1. With certain alloys it was less than 2. With steel it was about 7 to 1. These values must be regarded as rough approximations, and merely indicate the kind of numbers with which we have to deal. What they do show is that even if the whole of a sample of metal could be converted into material having the properties of a surface film, there is a definite limit to the hardness which could be imparted by the processes of cold

working. In other words, after a certain point had been reached further work would not confer greater hardness, but would cause fracture.

But if it be true, as before suggested, that it is impossible to convert the whole of any metal into thin films, in a parallel direction, then it would follow that the attainable limit for increased hardness is below the figures which have been previously mentioned. In practice, for example, cast copper has a tenacity of from about 10 to 14 tons per square inch. When it has been drawn as far as is mechanically possible, in view of the purposes to which it is to be applied, its tenacity is from about 24 to 28 tons. Roughly, therefore, its tenacity has been doubled. In some cases less than this is possible; in exceptional cases more can be obtained. But always the maximum is only a small multiple of the original.

Even if we had information as to the proportion of the mass which had been converted in stretched films, it would not appear possible to calculate what the increased hardness or tenacity should be, and so check it by experiment. For if we accept the view that these planes are like so many strong

bands passing through the material; that they are of varying length, and crossing and interlocking with each other at an indefinite variety of angles, it will be seen that we are dealing with a system of astonishing complexity which none of the usual methods of examining stresses would be able to unravel.

In a recent paper by P. Ludwik the view is expressed that the phenomena of cold working are not explicable by Sir George Beilby's amorphous hypothesis, or by Tamman's translation hypothesis. Ludwik draws attention to the fact, which had already been stated by Professor H. M. Howe, and carefully studied by Matthewson, that the greater the amount of mechanical work the lower is the temperature at which softening takes place on annealing. In the foregoing remarks I have endeavored to show that if it be assumed that the amorphous material exists in the liquids, then the results of cold working can readily be understood. And it would appear to follow that the more numerous these films are, and the more they are strained, the more readily will they tend to adjust themselves as the temperature is raised.

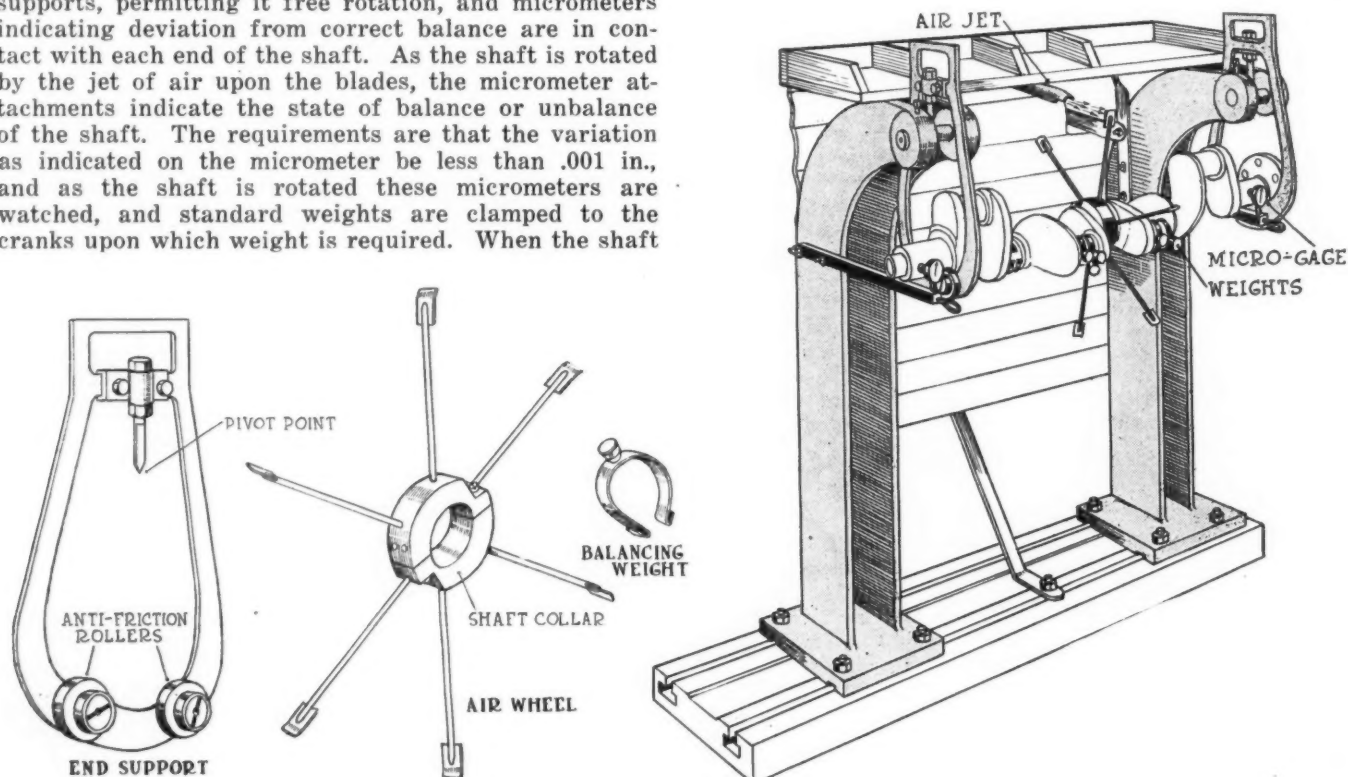
Drive Crankshafts with Air Blast in Balancing

A NEW method of counterbalancing crankshafts has been evolved by the Continental Motors Co., Detroit. Its purpose is to do away with any deviations in accuracy which may be caused by the mechanical means employed to rotate the crankshaft which is to be balanced. By the new method employed in the Continental balancing room, a collar is clamped to the center of the crankshaft, carrying six small fan blades, forming virtually an air turbine. A jet of air is played upon these blades, by means of which the shaft is rotated practically without vibration due to impulse, and without any of the errors which may creep in as a result of the solid attachment of the shaft to a rotating device.

The shaft is carried at each end upon anti-friction supports, permitting it free rotation, and micrometers indicating deviation from correct balance are in contact with each end of the shaft. As the shaft is rotated by the jet of air upon the blades, the micrometer attachments indicate the state of balance or unbalance of the shaft. The requirements are that the variation as indicated on the micrometer be less than .001 in., and as the shaft is rotated these micrometers are watched, and standard weights are clamped to the cranks upon which weight is required. When the shaft

has been brought into balance by adding these weights, it is taken to the bench and the necessary amount of metal taken away to secure the running balance indicated upon the balancing system.

This method is the nearest possible approach to having the crankshaft absolutely free. It is not held solidly in any position and allows every factor which would destroy the balance of the shaft to be shown up on the recording instruments. The air stream, being constant, gives practically a continuous non-impact method of rotation of the shaft, and after a short period of practice the operator is soon able to secure a high degree of accuracy in putting the crankshafts into balance.



Details and general diagram of Continental crankshaft balance drive by air blast

Aviation Engine with New Features

Design for Aluminum Twelve-Cylinder Motor Shows Neat Layout of Detail

RAYMOND M. HOWARD, mechanical engineer, of Detroit, Mich., has designed a twelve-cylinder, 60-deg. type, vertical, water-cooled airplane engine, having a propeller speed of one-half the crankshaft speed. The engine has a displacement of 1145 cu. in., the bore being $4\frac{1}{2}$ in. The power output should be 200 hp. at 2000 r.p.m. and 300 hp. at 3000 r.p.m., according to the designer. The engine is featured by compactness of dimensions, the over-all length being 58 in.; the width, 38 in.; height, 33 in.; width at bed, 17 in.; and the height from bed, 21 in.

The crankcase and both rows of cylinder water jackets are one integral aluminum casting. Part of the inlet manifolds are cast in this block, and the crankshaft bearings are supported by webs and the entire case is ribbed. The cylinders are steel sleeves machined all over and ground and held in place by the cylinder heads.

Aluminum is used for the cylinder heads, and they contain part of the inlet manifolds and exhaust ports. The valve seats are of cast iron and are cast in place, provisions being made for two spark plugs per cylinder. These enter horizontally and are on the outside of the cylinder heads.

Exhaust and inlet valves are $2\frac{1}{4}$ in. in diameter and are made of tungsten steel, the stems being large and drilled hollow for lightness. The valves are placed at the angle shown in the section, which allows the use of one cam to operate one pair of valves. This is said to be a new feature.

For the camshaft housing an aluminum casting is used. It is ribbed and bolted to the cylinder block and

it also carries the tappets and tappet bushings. The pistons are of the hour-glass type and are made from aluminum alloy, and the heads are deeply ribbed for cooling and strength. Two Burd rings are provided. The wrist pins are of large diameter and are made of chrome vanadium steel, hardened and ground and are hollow. They are clamped in the upper end of the connecting rod and work in bearings in the piston.

The crankshaft is of the three-bearing type, and is made of chrome vanadium steel, heat treated and machined all over. The connecting rod pins are drilled hollow for lightness and for oil passages, all pins and bearings being ground. The crankshaft is mounted on three large S. K. F. self-aligning ball bearings.

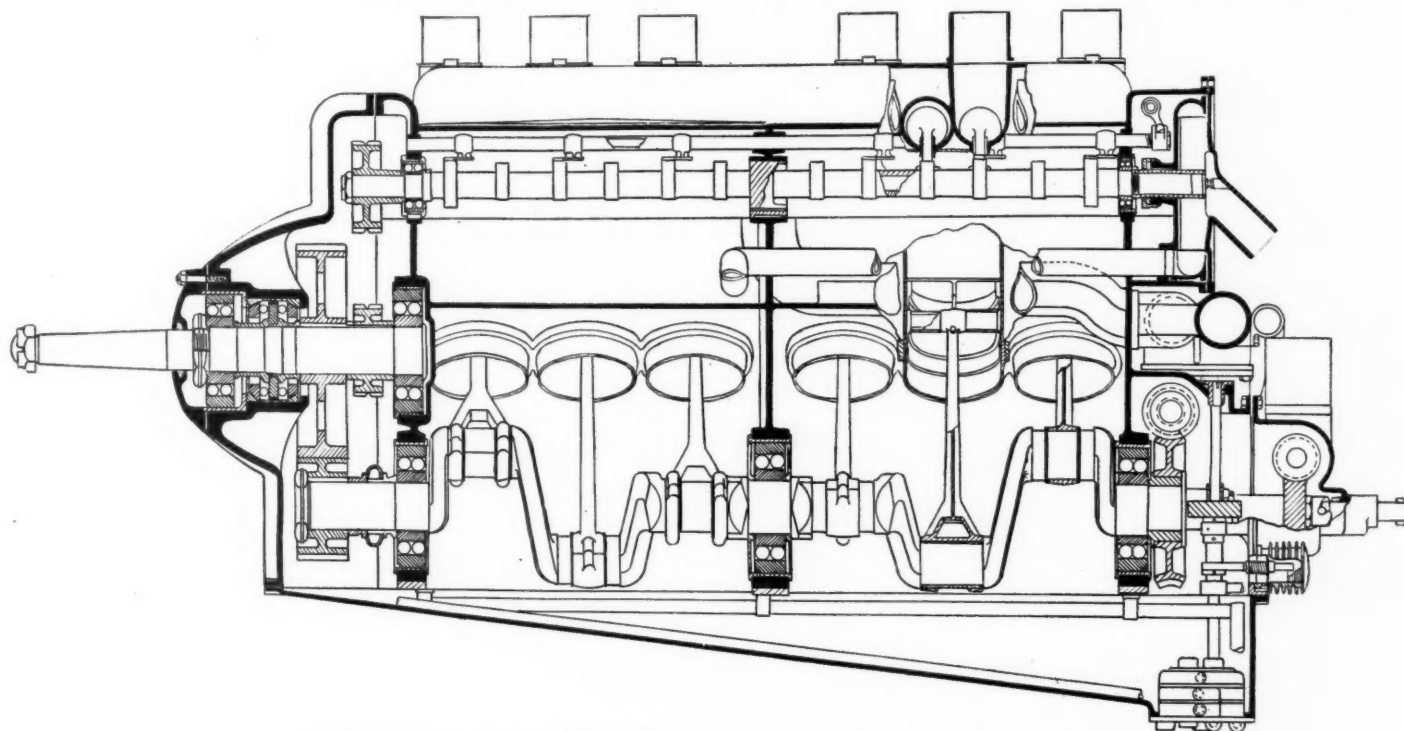
Has Compression Release

The camshaft is also made of chrome vanadium steel, heat treated, hardened and ground, and is drilled hollow for lightness. There are twelve integral cams, and the camshaft is driven by the propeller shaft with the aid of a Morse chain, and is mounted on two S. K. F. self-aligning ball bearings, with plain bearings in the center. All bearings are oiled under pressure.

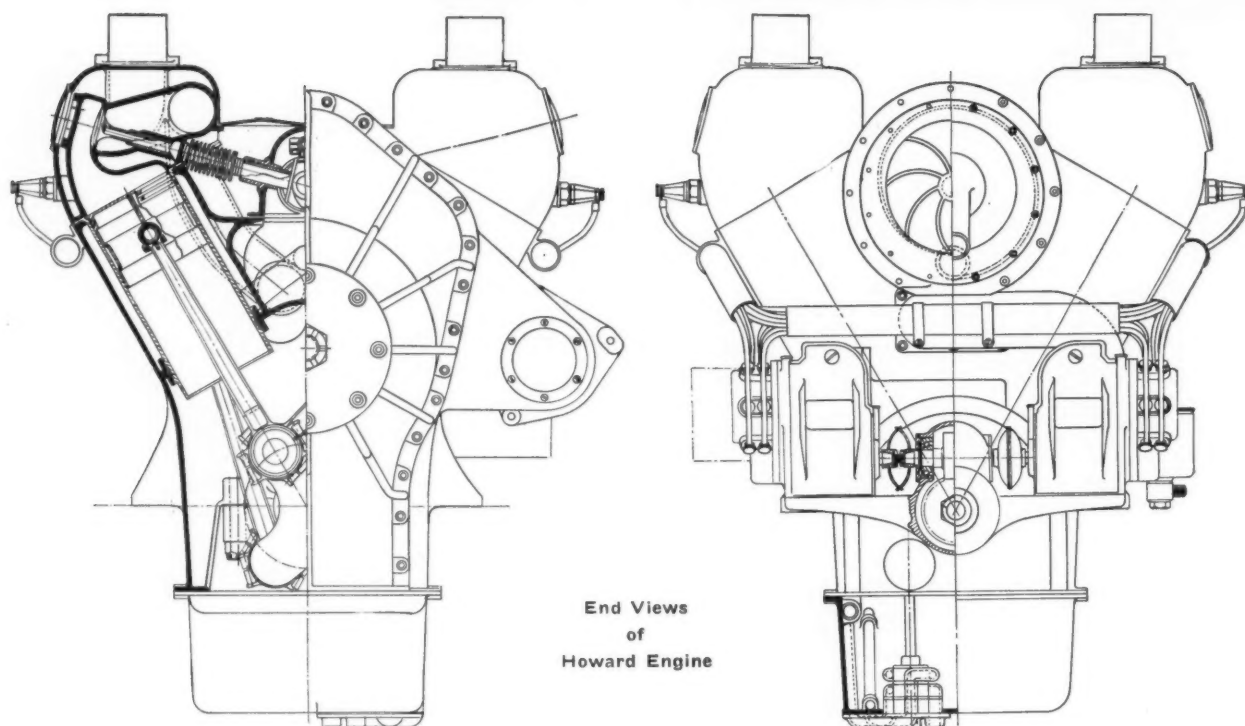
Fork type rods are used. They are made from chrome vanadium steel forgings and machined all over. The connecting rod bearings are made of Fahrig white metal, bronze backed.

A compression release is provided, which raises all the exhaust valves simultaneously, therefore making it easier to start and allow the proper means of stopping. A duplex Zenith carburetor is used.

The propeller shaft is driven from the crankshaft



Section of Howard aviation engine showing sliding rocker shaft for compression relief



through spur gears of chrome vanadium steel. It is carried on two large S. K. F. ball bearings, which are housed in the aluminum gear case. An S. K. F. ball bearing takes care of the thrust of the propeller.

Bijur starting and lighting is provided. The starting system has been arranged so the Bijur electric starter cranks the motor by the aid of a worm-gear mechanism, which is also claimed to be a new feature. A tachometer and air pump are fitted and are driven by the oil pump shaft at the magneto end of the motor. Two twelve-cylinder Dixie magnetos are also provided, each having an entirely separate system of wiring and plugs.

A centrifugal water pump is used. It is made of aluminum and is of ample capacity to cool the motor under excessive load, with the proper size radiator. The pump is driven off the camshaft at one-half crankshaft speed. Oil is forced under pressure to all bearings by means of a high-pressure pump. This pump is located in the oil pan at the magneto end of the motor. It is a triple type driven by a vertical shaft through spiral gears off the crankshaft, and runs at

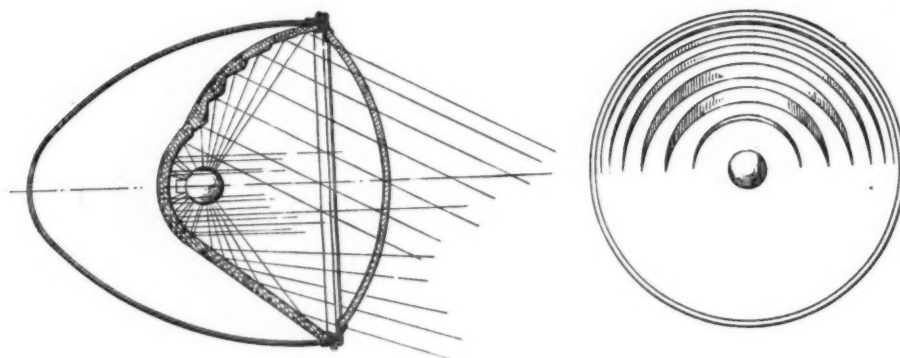
crankshaft speed. The upper layer of this pump is the pressure pump which delivers oil under pressure to all the bearings. The center layer is a scavenge pump which returns all surplus oil at the propeller end of the motor to the reservoir. The lower layer is also a scavenge pump which returns all surplus oil at the magneto end of the motor to the oil reservoir. The oil reservoir is entirely separate from the crankcase, and can be made of any desired capacity; all surplus oil is strained and cooled thoroughly before returning to the reservoir. It is claimed that under no circumstances will the oil flood the cylinders, and that the oiling system is not affected by any angle of flying; also that the machine can completely capsize without flooding the cylinders. An instrument is provided and mounted in view of the pilot to show at all times the amount of oil in the reservoir. There is also a pressure gage mounted in front of the driver indicating at all times the pressure in the oiling system.

The motor complete with electric starter and generator will weigh approximately 650 lb.

Heckert Headlight Reflector

L. HECKERT of North Humberland, Pa., has invented a headlight reflector which limits the field of illumination without reducing its intensity, confining all of the reflected

rays to an area below the axis of the reflector. The upper part of the reflector is provided with a series of arc-shaped concentric reflecting bands, separated by other bands, which are so disposed as not to be directly illuminated by the lamp. The illustration shows the form of the reflector and indicates the principle on which it works. The effect is, of course, dependent upon correct focussing.



In the Heckert reflector, the anti-glare problem has been attacked in a new way. Instead of attempting to control the light beams after they have left the reflector, Heckert controls them at the reflector itself.

Governments Must Help Trade After War

- 1—International Good Will Demands Best Use of World's Resources.
- 2—Each Nation Must Do With All Its Might That Which It Does Best.
- 3—Germany's Lesson in Fostering Trade Can Be Turned to Good Use.

By George E. Roberts

Assistant to the President of the National City Bank

THE war is causing an enormous drain upon the resources of the countries engaged in it and we hear much vague talk about the crushing burden of indebtedness which is being piled up for these peoples to bear, but it is a significant fact that all of them are planning now for the reconstruction of industry and for a vigorous extension of foreign trade when the war is over.

When the war began it was common opinion, even among financiers, that it could not last very long because it would be impossible for the governments to raise the money to carry on war on the modern scale for any length of time. In the first year of the war people said that all the accumulations of the past were being swept away, and that the world would be set back for a hundred years. But we have come to see that the war is not carried on by dipping down into the accumulations of the past, or at most that is true only to a minor degree. The war is being carried on with the labor and the production of the present. There is an enormous consumption of materials and supplies of current production, but outside of the territory actually overrun by hostile armies there is little destruction of property that was in existence before the war. The productive wealth of a country is in the land, buildings, mines, machinery, railways and other equipment of industry, and where these remain we may expect industry to speedily be resumed after the war.

Production Increased

Not only do these remain for the most part, but in many lines the facilities of production have been largely increased during the war. Thus the steel-making capacity of Great Britain before the war was about 7,000,000 tons per annum, and by the end of this year it will be nearly 12,000,000 tons. Moreover, war, horrible and deplorable though it is, unquestionably is a great stimulus to a people. Under the pressure of necessity, invention is quickened, industry is lifted out of its ruts, old customs and restrictions are abandoned, and industry makes more progress possibly in a year than in ten years of ordinary times. In Germany a census of industrial operations taken

THIS address, for it is more than a paper, was given to the Editorial Conference Oct. 2. It is the opinion of a man highly skilled in the intricacies of commerce, delivered to men highly skilled in judgment of the truth.

The Editorial Conference is a body composed of the chief executives of nearly all the great trade papers of the United States. It meets frequently for the purpose of hearing opinions such as Mr. Roberts' on matters of national importance, and for discussing them. Its purpose is to assist those whose message goes out to many thousands to get the right view on big subjects and to get it quickly and unanimously. Since its formation last year it has heard from many of the leaders of great industries, but never has it had an address more to the point or more informative than this.—EDITOR'S NOTE.

in March showed that more women were employed than men.

The burden of indebtedness after the war is commonly exaggerated by the assumption that all payments upon it, of interest or principal, will represent capital extinguished. It is true that the original expenditures of capital were unproductive, but payments upon the debt will be of new capital, and since it will be paid for the most part within the country, and largely to the same people who pay the taxes, it will still be available for investment, for the employment of labor, and for support of business.

After-War Plans Ready

It is therefore undoubtedly a mistake to suppose that the warring countries will be prostrate after the war, or long incapacitated for active competition in the markets of the world. The truth is that they are busy now with plans for aggressive activity, and these plans indicated that their efforts will be more effectively organized than in the past.

Before the war the two great industrial countries of Europe, Great Britain

and Germany, presented a marked contrast in their national policies toward trade and industry. Great Britain was still strongly individualistic in its ideas of business policy while Germany was distinctly paternal. Allowing that this difference may have been due in part to the political institutions and social characteristics of the people, it was largely due to the fact that Great Britain was the pioneer country in developing the factory system of industry, and had but little competition to contend with in the early period, while the German industrial development has been recent, and had to be accomplished in conflict with the well-established industries of Great Britain. Germany adopted the policy of protection to preserve her home markets, and followed up that action by developing a systematic policy of organized aggression to establish herself in foreign markets.

Governmental Authority Exerted

The authority of the Government was directly exerted to secure the most economical organization of German industries, to provide a system of schooling calculated to promote the scientific development of industries, to provide the banking support required for large scale production and for a liberal system of credits in new markets, and, finally, a system of mail and transportation lines, giving direct access under the German flag to all important markets. Other countries have been amazed at the revelations of German trade policies as they have gradually come to light, and particularly at the part which the government has played. I am free to say that I do not believe it is practicable for any government other than a highly centralized one to go the lengths of interference in business affairs which the German government has gone, and the extraordinary growth of German industry under this fostering management probably explains the strength of the government with the people, notwithstanding the fact that its autocratic features are in conflict with modern ideas.

The war immediately and of necessity added enormously to the responsibility of governments. In the sudden disruption of international relations there was no way to save the business situation from

chaos except by having the government assume functions which it had never exercised before. It was not a matter of choice, or of preference for governmental administration. It was necessary that there should be a central directing authority with full power to command the entire business situation. The British government authorized the Bank of England to take over from the other banks certain commercial paper which had suddenly become uncollectible, and agreed to protect it from loss in so doing. The railways were taken over for government management during the war. From this beginning there has been a constant extension of governmental authority, as the magnitude of the war has more and more compelled a concentration of the nation's energies, until scarcely any important branch of business is free from it.

Result of Supreme Emergency

All of this has come about because the nation faces a supreme emergency, but with the grave problems which are to follow the war the situation is favorable to the arguments of those who advocate a permanent extension of the government's functions. In the first place, there is a strong argument in favor of having the government keep a firm hand upon the situation, at least until after the period of industrial reorganization has been passed.

It is generally agreed that during the period of demobilization and while business is getting itself re-established in its accustomed channels, the situation should have the supporting hand of the government upon it. Opinions differ as to how far the government should go in undertaking industry on its own account, and to what extent it shall permanently retain the functions which it has assumed during the war. So many proposals are pending that a "Ministry of Reconstruction" has been established, with a seat in the Cabinet, to deal with them.

All of this leads still further. England's great debt with an interest charge after the war of possibly \$1,500,000,000 per year, is a spur to greater national effort. There is a feeling that the nation itself must exert itself, from one viewpoint in order to obtain a more unified effort, and from another viewpoint in order to obtain for the treasury the profits of enterprise. Of course, there is much that is obviously fallacious in the arguments, but they are significant of the trend of thought.

React from Germany

This feeling is a natural reaction from the war with Germany. The object-lesson of German development, with the belief that German policies were aimed particularly at England's undoing and have been promoted by England's neglect, has made a great impression upon the English people. The response is a natural outburst of determination on the part of a virile people, who want the national powers concentrated and directed to certain national aims.

And so England is seething with agitation for national and imperial under-

takings after the war, involving in one way or another action by the government. The leading idea is to draw the parts of the Empire more closely together and to reorganize and direct industry to greater efficiency and to a more rapid development of the Empire's resources.

The Imperial War Conference, composed of the Premiers of the United Kingdom and the overseas Dominions, has adopted the following resolution:

"The time has arrived when all possible encouragement should be given to the development of Imperial resources, and especially to making the Empire independent of other countries in respect of food supplies, raw materials, and essential industries. With these objects in view, this conference expresses itself in favor of the principle that each part of the Empire, having due regard to the interests of our Allies, shall give specially favorable treatment and facilities to the produce and manufacture of other parts of the Empire."

Lloyd George has recently made the public statement that Great Britain will give a preference in customs duties to the colonies, and that it will not increase the price of food.

A British Effort

One of the notable symptoms of the movement is the organization of a body called the "Empire Resources Development Committee," with which an impressive group of names is associated. Its purpose is to act as an advisory board in the selection of suitable projects for governmental adoption, and in the management of such enterprises—to quote the language of the prospectus: "so that imperial effort may be concentrated upon assets ripe for development for the common good of the Empire." The statement says:

"We, the undersigned, realizing the immense latent resources of the Empire and the possibility of developing this great and varied wealth for state purposes, under state auspices, and so lifting from the peoples of the Empire the burdens caused by the war, have formed ourselves into a committee for the following purposes, etc."

Now these are generalities; nor are there wanting people on the spot who say that the proposals are visionary and that, if followed up, they may easily involve the government in vast unproductive expenditures.

Shows National Spirit

Nevertheless, this outburst of constructive energy is an exhibition of British national feeling and of the disposition to use the government as an agency to forward the national purposes. Under the direction of a committee of the Privy Council for Scientific and Industrial Research, the British Government has subsidized a movement for the study of applied science in the industries. The first grant is of £1,000,000. The plan is to incorporate research associations in each line of industry in which the manufacturers are willing to co-operate, these associations to be given grants of

aid. Already a half dozen or so industries have taken steps to organize as proposed. Besides the work of these associations there will be committees for more general research work, such as into the fuel problem, and steps are being taken to correlate the work of these research laboratories with the public schools. The attitude of the government is indicated by a subscription on account of the treasury for stock in a new company to develop the dye industry.

England Develops New Plan

The British government has developed a plan for reorganizing the commercial attache and consular services, and for the creation of an enlarged commercial intelligence department. The official announcement begins as follows:

"It is clear that after the war the demands upon the Government for the collection and diffusion of commercial intelligence for the benefit of British trade are likely to be very much greater than in the past. Both the Board of Trade and the Foreign Office have for some time past been maturing plans for developing and improving the official arrangements for commercial intelligence so far as they fall within their scope. The Board of Trade have obtained the sanction of the Treasury for a large development of the Department of Commercial Intelligence and for a wide expansion of the system of Trade Commissioners within the Empire."

For the promotion of foreign trade, Parliament has granted a charter for a Trade Bank, with an authorized capital of £10,000,000, of which £1,000,000 has been paid in. The purpose of this bank is to assist British merchants in giving more liberal credits in foreign trade than they have been accustomed to in the past, in this respect following the German practice. The bank is also expected to look up foreign contracts and foreign investments, and it is worthy of attention that in the discussion the organization of the American International Corporation with \$50,000,000 capital was frequently referred.

The Canadian Senate has taken action looking to the establishment of similar institutions for Canada.

Germany Prepares

We know enough of what is taking place in Germany to know that the national policy of fostering and supporting the industries will be maintained and more highly developed in the future. The dye industry has already been reorganized by consolidation and close agreement to make an aggressive struggle for its old position of domination. The government has submitted to the Reichstag a bill for a grant to assist the German shipping companies in re-establishing their fleets after the war. The measure bases its proposals not upon any obligation to reimburse citizens for war losses, but upon the necessity for securing the maritime interests of the nation.

In general, the war has tended to develop national spirit, and to prompt the peoples of all countries to use the govern-

ment organization as an agency for promoting national trade, and it behooves the United States to be awake to its own interests. This country holds a strong position as the producer of many of the essential raw materials, and also as having the greatest consuming market in the world. It is in position to negotiate for fair treatment in all markets.

Domestic Conditions After War

It may not be directly pertinent to the subject assigned for this paper to touch upon the importance of giving consideration now to domestic conditions after the war, but the post-war plans of other countries suggest it. Industry has been under an enormous stimulus in this country for now two years. As a result, wages and prices have been advanced until the basis upon which business is done is radically different from what it was before. After the war a readjustment must undoubtedly be made, whether rapidly or gradually, to a lower level, and it is a familiar fact that there is more difficulty about making an adjustment downward than one upward. We have reason to believe that basic conditions in this country will be sound. Real estate values have not been inflated. Standard stocks and securities are low as compared with the past and considering the values that have been put behind them in the last two years. The industries are in a stronger position financially, and more effectively equipped, than ever before.

Creditor Nation After War

The country has more wealth than ever before, and at the end of the war will be in a very strong position as a creditor nation. Our gold supply, which is the basis of bank credit, will be protected by the great amount of claims on Europe which we will hold. The demands of the war upon our industries have been so great and will continue so great while the war lasts that much construction work has been postponed, and is waiting to be done under more favorable conditions. The whole world is short of goods of every description, and our industries will be more completely ready to supply these wants than those of any other country. The fundamental conditions therefore are favorable to large production and good business in this country following the war.

The U. S. Underbuilt

The one question here, as abroad, is whether business will go on without serious interruption, making the adjustments gradually, as the cost of living and raw materials decline, or whether there must be a period of stagnation. Since the country is really underbuilt and understocked, and insufficiently equipped in many respects—notably in its railways—and since the buying power of the country is greater than ever before, the question of maintaining business is simply a question of maintaining confidence. Men will want to know what others are going to do, what the general trend is to be, and will make their plans accordingly. The problem then is to sustain confidence

in a situation that fundamentally deserves confidence, and this requires leadership and co-ordinated action on an important scale.

The opportunity for such action is afforded by the railway situation. It has been demonstrated that notwithstanding the great amount of capital expended upon the railways in the last 17 years, their development has not kept pace with the growth of traffic. Daring as the plans of some of the leaders in the railway world appeared to be 17 years ago, the country has outgrown the facilities of even the most enterprising companies. Furthermore, it is apparent that the railway problem cannot be adequately dealt with by the companies acting independently and alone. The situation requires comprehensive treatment, particularly at terminals, looking far to the future, and requiring an amount of capital which the companies alone cannot undertake to raise in the state of the world's money markets in the near future, nor can expenditures planned upon a scale to adequately care for the future be expected to be immediately remunerative to the railroads, although the improved service would be advantageous to the country.

Advance of Mechanical Engineering

The advance in mechanical engineering, particularly in the application of electric power to railway service, affords opportunity for the profitable expenditure of large sums. The country is right on the verge of large possibilities in the way of economical power production, not only for the railways but to serve the industries in conjunction. An extensive scheme to develop and improve the country's transportation system would do more to equip the country for economical production, and to enable it to hold its own in world's markets than perhaps any other single thing that can be done, and if such a program could be ready for announcement at the close of the war, it would put an end to all uncertainty and apprehension about business conditions in the United States in the period following the war. It could be so adjusted and carried out as to take up all the industrial slack for years to come.

The Government's relation to the railroads up to this time has been wholly restrictive, but the time has come when it ought to be also constructive. Regulation is inevitably restrictive in some respects, and this phase of it tends to divert capital to other employment. To offset this effect the Government's relation to the railway business should be constructive as well as restrictive, giving some positive aid to the support and development of the great transportation industry, which it recognizes as holding a vital relationship to all the other industries.

Government Credit

Such a program can only be promptly and adequately carried out, under the conditions which will exist at the close of the war, by the aid of government credit, and it should be done under a just and reasonable arrangement between

the companies, and the Government, which will ultimately reimburse the Government, and at the same time provide an incentive for the initiative and enterprise of private management, and secure to the public the benefits of better service.

Must Establish Fair Practice

It is undoubtedly important that our own Government shall be on its guard to protect the industries of this country against the aggressive policies of other countries, and be on the alert to promote our foreign trade by all legitimate methods. I have, however, already indicated that I do not believe it practicable to adopt in the United States all of the methods which may seem to be successfully practised by an autocratic government. Moreover, if there is any lesson to be learned from the war it is that in order to maintain peace among the nations it is necessary that the trade of the world shall be established upon certain broad principles of equity and of community interest. There should be a standard of fair practice which every nation would be required to observe under penalty of united retaliatory action by other countries. Practices which would be uneconomical if adopted by all countries, which provoke retaliation, and which violate the principles of fair, open trade, should be outlawed.

When peace is restored, it is of the greatest importance that international relations shall be re-established upon an enduring basis. If the energies of the nations, instead of being devoted to recuperation, should be given largely to preparations for a future conflict, the outlook for civilization will be hopeless. The world cannot afford to have irritation and antagonism develop at the points of national contact, and those points of contact are chiefly in trade relations. Competition there is bound to be, and on a fair basis it is stimulating and wholesome.

Right of Country to Protect Industries

The right of each country to protect and develop its own industries with a view to safeguarding its supply of necessities, and of diversifying its production, cannot be questioned, but systematic efforts to force the trade of a country, to the disturbance of normal trade relations, may well be regarded a proper subject for international conference. In the large view, the interests of all peoples will be best promoted by such an intelligent correlation of resources and industries as will produce the best economic results.

It is in the interest of the international community that all countries shall be prosperous, and this is best accomplished by the maximum production and by stable conditions favorable to investment and trade. The leadership which any country is able to attain by the development of improved organization or the application of scientific principles is a legitimate and useful leadership, and if international rivalries can be confined within this field the peace of the world will not be imperilled.

Metal Hose Without Packing

New Variety Guaranteed Gastight That Can Be Used for Gasoline—
Withstands High Pressure

A NEW form of flexible metal tubing has several qualities which cause it to differ from the accepted, conventional sort, and which make it available for classes of service not within the scope of tubing which is made tight by packing. It is all metal, with no softer material in its make-up. Either steel, brass or copper can be used, and the base metal can be coated with lead or plated in some other way before the tube is made from the strip.

The original material consists of a strip, very similar to that used for other types of tube, but this is so rolled that the edges are not only interlocked, but are so tightly compressed together that there can be no movement within the junction. The flexibility is given by the elasticity of the metal and not by the sliding of one part over another.

The diagram herewith shows the form of the joint, and it will be noticed that there are four thicknesses of metal on the join, which is the outer periphery of the tube. The walls of the tube and the inner periphery have only one thickness. Thus, regarding the section of one little piece of the tube, it follows that each ridge of four ply is connected to the next by a U shape of thin metal. This allows considerable flexibility without stressing the material beyond its elastic limit.

The tubing is wound spirally, of course, and the joint is consolidated by a process which follows that of forming the tube, making what the manufacturers call a "cold weld." The existence of the four thicknesses of metal on the outside add mechanical strength and make the tube strong against crushing.

Another quality possessed by this tubing is that of variable flexibility. As it comes from the rolls the spiral has a certain pitch, but if the ends of the tube are forced toward each other the pitch is reduced and the flexibility increased. Conversely, by pulling on the ends the pitch is increased and the tube becomes stiffer. This means that where only slight flexibility is wanted the tube can be made stiff enough to be firm, and yet remains easy to bend to shape originally. Being entirely metallic, it can be

soldered as readily as solid tubing, and the makers have some couplings which attach by screwing on the ends, where they are fixed by solder if necessary. Flanges are easily attached or almost any kind of union. The tube appears to be peculiarly suitable in automotive work for gasoline lines, especially airplane lines. Vibration is not liable to cause fracture, as it may with copper pipe; nor does frequent bending by constant handling injure the tube. Its flexibility also makes it much easier to apply in awkward places, and it cannot put any stress on unions. Spring in a copper pipe is very liable to cause the thread on an inaccessible union to be crossed in assembling, and this danger is removed by the use of flexible pipe.

A somewhat simpler form, with less overlap in the joint, but on the same principle, is being made and experimented with for exhaust lines. It is claimed that the corrugation gives the pipe great area in proportion to its length and so causes rapid cooling. In fact it is stated that a length of tubing with a few deflectors placed inside near the end is sufficient to muffle an engine without any conventional muffler whatever.

Naturally flexible tubing which is permanently pressure-tight has many applications outside the automotive field. In fact one of the principal uses to which this material is now being put is for conducting water to hydraulic machines used in the navy yard. For this purpose it is twice inclosed in other tubing as a protection.

In cases where its variation in flexibility due to compression or pulling out might be an annoyance, it is inclosed in a lattice of metal, which is inextensible lengthways but perfectly flexible; and for garage air lines or other places where it receives rough handling it is put inside a cheap form of heavy interlock tubing of conventional design but without packing.

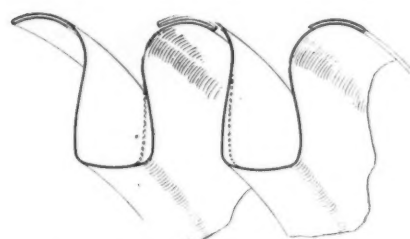
It is pointed out that its use for water connections on an automobile would remove the necessity for rubber hose altogether, and small lengths of it would serve this purpose. For such applications flange joints soldered to the tubing would make the best job, but a variety of other couplings is possible.

The manufacturers are the Titeflex Metal Hose Co., 120 Broadway, New York, whose factory is at Newark, N. J. The experimental shop, which has been operating for two years, is now being enlarged considerably, and the firm is able to take care of orders for large quantities. The name "Titeflex" is the trademark by which the tubing will be known.

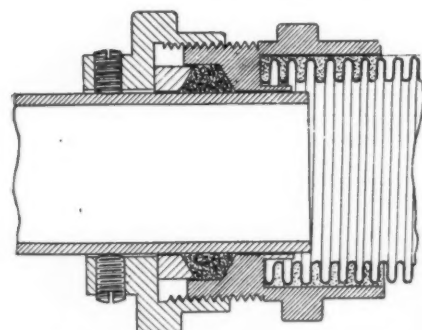
Simplified War Tax Table

A NEW method of illustrating the workings of the proposed excess profits tax is contained in a table prepared by Government experts. This table shows the tax on excess profits by round thousands, instead of on the basis of the percentage of excess. For example, a manufacturer whose average profit for the three years 1911-13 was \$5,000, would pay \$130 on the first \$1,000 excess, whereas one whose normal profit was \$1,000,000 would pay only \$120 on the first \$1,000 excess. The abbreviated table follows:

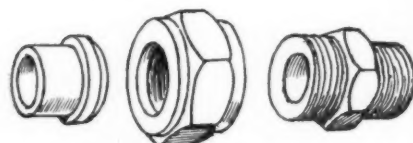
Normal Profit	Tax on first—					
	\$1,000 Excess	\$10,000 Excess	\$50,000 Excess	\$100,000 Excess	\$500,000 Excess	\$1,000,000 Excess
\$5,000	.....\$130	\$2,982	\$22,857	\$47,857	\$247,857	\$497,857
10,000	.....120	2,215	20,715	45,715	245,715	495,715
50,000	.....120	1,300	11,075	29,825	228,575	478,575
100,000	.....120	1,200	8,400	22,150	207,150	457,150
500,000	.....120	1,200	6,000	13,000	110,750	298,250
1,000,000	.....120	1,200	6,000	12,000	84,000	221,500



Method of forming Titeflex joint



Suggested coupling for water joint



Union for attaching gasoline line, the right portion solders to tubing and the left end part to carburetor or tank



Titeflex in compressed form with maximum flexibility

Automobile Exhibits at Electrical Show

Both Commercial and Private Vehicle Types Shown, as Well as Batteries and Gasoline Car Accessories

THE Electrical Show held annually in the Metropolis is now running at the Grand Central Palace, having been opened on October 10 and being scheduled to continue until the 20th. While the domestic appeal predominates at the show, electric heaters, cookers and lighting fixtures and electrically-operated washing machines being exhibited in great variety, automobiles of the electric type, storage batteries and various electrical appliances used either on the car or in the garage are also found among the exhibits. A good deal of space is occupied by Government Departments and by the Red Cross. Demonstrations are being given by the Signal Corps and there are extensive exhibits by the Department of Agriculture, the Signal Corps, the Census Bureau and the Weather Bureau. New York State also has an exhibit including models of locks, dams and dam operation, a war bread bakery, a model dairy and a transmission of mail through pneumatic tubes. The Red Cross exhibit includes working rooms, an instruction center, a tea room, and a collection of allied flags.

Educational Exhibit

At the stand of the Westinghouse Electric Mfg. Co. is shown a great variety of the products of this company. Including bakelite micarta gears, mercury arc rectifiers and small motors. At this stand there are also a number of highly interesting educational exhibits. One of them illustrates the difference between good and poor illumination, by bulbs located in adjacent compartments. It is pointed out that carbon filament lamps should not be used, owing to their low efficiency as compared with Mazda lamps. Lamp bulbs should always be fitted with a reflector, so as to direct the light where it is wanted. This not only gives improved illumination at reduced cost, but acts as a protection to the eyes of the workman. The lamp should not extend below the bottom of the reflector, as the glare of the direct rays from the filament is injurious to the workmen's eyes. Dirt on bulbs and reflectors often reduces the light emitted by as much as 40 per cent, and this loss is especially likely to occur in shops. A machine shop may have a sufficient number of lamps and yet the lighting may be poor on account of the bulbs and reflectors not being kept clean. This, therefore, is a matter that should be looked after. A model is also shown of a complete machine shop to illustrate a method of efficient shop lighting.

Products of Research Laboratory Shown

At the General Electric Co.'s stand are shown various products of the research laboratory of that company, which is known to be one of the best equipped corporation research laboratories in the country. Among these products there are two which are being used in the automobile industry, one being tungsten metal, which is used as a substitute for platinum for electric contacts, and the other moulded compound insulators as used for magneto parts, junction boxes, distributors, etc. This exhibit further includes samples of tungsten and molybdenum metal, tungsten tube anodes, coolidge tube cathodes, gold coated tungsten and molybdenum wire, alumina wire drawing dies, copper coated and alloy coated iron wire, etc.

An electric radiator heater manufactured by the Hughes Heating Co. is being shown at the booth of the Western Electric Co. This is placed under the hood of a gasoline car, close to the radiator or engine and is designed to keep the water in the cooling system from freezing on cold nights in an unheated garage. The device is in the form of a perforated sheet metal cylinder containing the heating element

and comes with about 8 ft. of cord and attachment plug for connection to a wall socket. The power consumption is at the rate of 100 watts, and with rates for current as now charged in New York City, the expense is at the rate of about one cent per hour. The price is \$5.

Three Makes of Electric Vehicles

Only three makers of electric vehicles are represented at the show, these being the General Vehicle Co., of Long Island City, N. Y., the Ward Motor Vehicle Co., of Mt. Vernon, N. Y., and the Baker, Rauch & Lang Co., of Cleveland, Ohio. The first of these, the General Vehicle Co., has on exhibition a 3½-ton electric truck with slat side body, which is being shown loaded to capacity with bales of rope. This company's electric commercial vehicles, which are very familiar to residents of the metropolis, include models of from 1000 lb. to 6 tons capacity and have been on the market since 1902. The General Vehicle Co. is also engaged in the manufacture of Gnome rotary airplane engines, for which it holds the American manufacturing license. These were originally built for the British Government and are now being supplied to the United States Government. A complete Gnome 100-hp. engine with propeller attached is shown on a stand at the company's booth, and there is also a display of various important parts of the engine.

The Ward Motor Vehicle Co. exhibits a 2-ton truck chassis and a 750-lb. truck chassis. These are worm-driven vehicles of simple and rugged design. In the case of the 2-ton vehicle the battery is carried in an underslung sheet steel battery case, extending far out from the side of the frame, about even with the hub caps. The motor is located forward of the battery box and transmits its power through a tubular shaft extending through a space between the two halves of the battery box, which is supported in a bearing at the rear of the battery box, and thence through the regular propeller shaft, which contains two universal joints. A drive corresponding to the Hotchkiss drive on gasoline trucks is used.

Four-Passenger Enclosed Cars

Two very attractive looking passenger vehicles of the same type are shown by the Baker, Rauch & Lang Co. These are four-passenger enclosed cars, known as model BX-7. They are built entirely in the factory of the Baker, Rauch & Lang Co. for the high-class trade. The body is of aluminum and has a roof of patented leather cloth, along both sides of which runs a gutter, which drains at the four corners, thus keeping the drip off the car and protecting the passengers in entering and leaving. The windows are set in rubber frames to prevent the water from blowing through and also to prevent rattling. All of the windows with the exception of the two curved corner panels can be let down, thus making the car an all-weather vehicle. The windows in the doors are operated by a handy crank and can be raised or lowered to any degree desired.

Among the mechanical features of this car the worm-driven rear axle deserves special mention and attention is also called to a new design of oil lubricated spring bolt, which makes use of a wick lubricator and takes the place of a grease lubricated bolt formerly used. Options are given on wood or wire wheels and on solid and pneumatic tires, the price being the same for both kinds of wheels and tires. The regular storage battery equipment consists of forty-one cells of 13 plates exide battery, but a certain latitude is also allowed the purchaser in regard to battery equipment. A choice is given the purchaser of any color and also of many

(Continued on page 699)

AUTOMOBILE *and* **Automotive Industries**

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Horace M. Swetland, President
W. I. Ralph, Vice-President E. M. Corey, Treasurer
A. B. Swetland, General Manager
231-241 West 39th Street, New York City

BUSINESS DEPARTMENT
Harry Tipper, Manager

EDITORIAL
David Beecroft, Directing Editor
A. Ludlow Clayden P. M. Heldt
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BRANCH OFFICES
Chicago—Mallers Bldg., 59 East Madison St., Phone Randolph 6960
Detroit—95 Fort Street, West, Phone Main 1351
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Cable Address Autoland, New York
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Standard Truck Runs

THE two standard military trucks built experimentally by Selden and Gramm-Bernstein have made their first trips from the factories to their destination. Though the few hundred miles covered do not constitute a conclusive test, they do prove that the truck is an excellent performer, both as regards power and other things.

It is lighter than the expectations; it is easy to handle, is particularly well sprung and it appears to be fairly economical of fuel and oil, though the records made in this respect are not announced officially. Of course, in commercial work it would be a five-ton truck and as such most who have seen the finished job and are qualified to judge consider it ranks high.

Those who have worked on this truck either directly or indirectly are so close to it that they can hardly realize the magnitude of the work which they have done. To many the few short weeks since Aug. 1 feel like as many years. Oftentimes things seemed to be scarcely moving; there were days when each declared that no progress whatever had been made, yet when all is considered the speed of the whole job has been nothing short of amazing.

Congratulations to all concerned are due for the

completion of a vast amount of work in an extremely short time. Congratulations are still more due for the fine appearance of the chassis, and for its initial performance. Now comes the anxious time of waiting to see whether intensive testing will develop any weak points.

The worst of the creation work is over, the production work is but beginning. By the time the O.K. stamp goes on every part the schedules for delivery will be finished. If production goes half as well as did design it will be possible to furnish all the trucks the army can use more rapidly than they are required.

M. A. A. Approved

THE Manufacturers' Aircraft Association was formed to help the government out of a situation that promised to become difficult. A way out was wanted quickly and surely; the association provided it. Perhaps there were other ways which would have been as good as that taken, but they would have been slower and delay was unthinkable.

To do a big thing quickly is impossible without raising opposition. Such opposition comes from two types; from people who cannot grasp anything big and from people to whom the word co-operation is anathema since they cannot distinguish between co-operation used for the good of a community and combination used for the exploitation of the public.

These are days when the ulterior motive was never more absent—days when things really are being done for patriotism, days when competitors forget their own interests. They are also days when manufacturers, especially of aircraft, will make money, and rightly so, for money must be earned and circulated and the prosperity of the country is its greatest asset in war.

Thus it is unquestionably just and right that official approval should be given to the aircraft association to protect it from the attacks which those who either cannot or will not understand have made upon it.

The Labor Situation

OWING to the scarcity of labor various schemes for making farm labor available in the factories during the winter months are being considered. Of course, to a certain extent there has always been a migration of labor from country to city and vice versa with the seasons. This, however, applies only to what may be called unsettled labor. The farmer and the farmer's sons, as a rule, do not go to the city in winter to look for employment. It is said that a certain maker of farm tractors now is working on a plan whereby young farmers, by working in the tractor factory during the winter, may acquire a tractor for the farm on advantageous terms. The plan looks feasible and certainly has some good points. For one thing it would tend to make these farmers more familiar with tractor mechanism and thus make them more skillful tractor tenders. No great educational influence should

not be expected from such a course, however, as to make the unskilled labor productive the work must be divided or specialized as much as possible.

Looking on the other side of the proposition, serious difficulties are sure to be encountered in putting the plan into effect. The slack season on the farm is only about four months long, and it would not do to operate a factory for only four months of the year. So other labor would have to be found for the summer months, and if a large percentage of all employees were to leave simultaneously with the opening of the farming season it would cause great inconvenience. The situation in the labor market, however, is such that any project which bids fair to relieve the immediate needs appeals to the employer. In other years there has been much complaint of unemployment in the large cities during the winter months, but this coming winter there will be work for all who are looking for it, and still more. A skillful direction of labor where it can be used to the greatest advantage is a pressing problem.

Enemy-Owned Patents

THE Trading with the Enemy Act, which has just come into effect, contains a section relating to U. S. patents held by enemies and allies of enemies. The provisions are very similar to a law passed in England about three years ago, in that provision is made for granting licenses under enemy patents to corporations or individuals on application if the President considers such licensing will promote public welfare. These patents belonging to enemies are not revoked or cancelled, but provision is made to permit of working them in this country during the period of the war if considerations of public welfare demand. The Government is given the power to exercise supervision over establishments in which these patents are to be worked, and it is required that a sum equal to 5 per cent of the gross receipts from articles manufactured under the patents be deposited in trust with the Government. Within a year after the end of the war the patentee may sue in the U. S. courts for the recovery of damages, and if the suit is decided in his favor royalty is to be paid to him out of the 5 per cent fund.

So far as is generally known, the automotive industries have not been seriously hampered by the interruption of commercial relations with Germany. While a good deal of important work in automobile development was done in Germany, most of the important U. S. patents taken out by Germans in this branch of industry are being or have been worked in this country. This includes the Daimler and Maybach patents, the Bosch patents on ignition devices and the Conrad and other patents on ball bearings. Possibly there are some materials used in the automotive industries on which there are patents in the names of Germans which are not being worked in this country. Thus it is understood that there are various synthetic insulating compounds produced in Germany which combine high dielectric qualities with great mechanical strength, and the high quality of German magnetos is ascribed in part

to the use of these insulating materials. However, there are now at least two such synthetic products on the American market which give very satisfactory results.

No doubt in other lines of industry, and particularly in the chemical industries, numerous applications will be made for licenses under enemy-owned patents. One question that arises in this connection is the status of a firm working such patents at the end of the war. For instance, if extensive plants for working the patent were laid down and the firm was suddenly deprived of its license, a heavy loss would be almost sure to result. This contingency may have to be met by further legislative action. Most of the valuable patents are owned by financially powerful corporations, and while the successful exploitation of the patents in this country during the war would be ground for continuing to work the patents here after the war by arrangement with the patent owner, the latter would have the advantage in the negotiations. A compulsory working clause added to the patent law would tend to make the patent owner more inclined to come to terms with the licensee. So far our tariff has made it necessary in the case of many foreign-owned patents to work them in this country in order to profit by them, but this does not apply to more or less basic patents.

Tractor Wheel Lugs

AN important problem in the design of agricultural tractors is that of a traction wheel which will give sufficient traction under all conditions. When it is considered that a tractor, in addition to propelling its own weight, must exert a drawbar pull nearly equal to this weight, it will be realized that there must be an unusual adherence between the wheel rim and the ground. What complicates the problem is that the same wheel must travel satisfactorily over hard roads. Steam tractors have been built for many years, but their use has been confined mainly to roads, so the problem of a tractor wheel as it confronts designers to-day is absolutely new.

Large, deep lugs secured to the wheel rim and which project therefrom perpendicularly give sufficient traction at least under all ordinary conditions. But they interfere with the use of the wheel on hard roads and also result in waste of power due to forcing them into the ground and drawing them out again. For best results the form of the driving lugs should vary with the nature of the surface driven on, but, unfortunately, a tractor must negotiate all sorts of surfaces, and the lugs are not readily interchangeable. A wheel in which a set of lugs are held on by a single quick detachable clamping ring might be of advantage from this point of view.

It has been suggested that the S. A. E. should standardize driving lugs, and while this may eventually be done to advantage it is rather too early in the history of agricultural tractor development to formulate such standards. The problem is now receiving the attention of inventors, as is evidenced by the many new designs being announced.

□ Latest News of the

Enemy Trading Act Not Drastic

Restrictions Made by It Would
Obtain Anyway, Says
Redfield

NEW YORK, Oct. 16—The Hon. William C. Redfield to-day made a long address on war and matters relating to the effects of war on commerce, to the Editorial Conference. The major portion of the speech was devoted to the causes for the war and a definition of the things which America and the Allies are fighting. Mr. Redfield explained that the new trading with the enemy act is a very real thing, and he especially pointed out that restrictions on the sale of materials to neutral nations were necessary because there is little in the way of raw material that is not wanted directly within this country for immediate use.

"The restriction of the act will exist whether there is any act or not," said Redfield. "It is and has long been the law of nations that in time of war all communication with the enemy of all kinds is prohibited. It didn't need this act to make it improper, an act of wrong, to sell goods to the German in Germany, or to ship goods to South America, knowing that by that means they would reach Germany, or reach anybody so as to aid Germany—that is just as strongly forbidden if this act were repealed to-morrow. The prohibitions of the act are not new; they are simply clearly stated and made plain by the language of the law—but they existed before."

"The law, then, provides a clarification of these facts, making it perfectly plain what trading is, defining it, defining very clearly with whom trading is forbidden; that is to say, defining enemy and defining ally of enemy; but it does not make new law when it does that; it merely states what was the law before."

"Then it proceeds to provide a system of licenses whereby anything which is unlawful in the act, or without it, of that character can be legalized by a license."

"Now, there is in the bill, however, a very original, as far as I know, a novel clause. This clause provides a custodian, an official custodian to whom all interest, dividends, etc., belonging to such enemies or enemy allies can be paid."

"In the original bill it had to be used for certain purposes, but in the present form it may be used to purchase Government bonds, so that in that way the property of enemies may be used to finance the war against them, with the understanding, which is a very interesting one and one which is the act of a good sport like Uncle Sam, that this property is not confiscated, but it is by the alien property custodian to be preserved and after the war Congress may, at its own will, dispose of it as it sees fit; which means, of course, that it is quite possible, I think it quite probable, that it will be returned after the war intact to its original enemy

owners, we having had the use of it meanwhile for our own purposes."

Mr. Redfield also explained the working of the enemy patents regulations, how an American manufacturer may use such a patent by paying the U. S. Government a 5 per cent royalty which might or might not be handed on to the owner after the war. He said:

"An American can use an enemy patent if he secures a license for a very small fee, limited, I think, to \$100, but he must pay 5 per cent of the value of the articles which he makes under that patent in to the alien patent custodian."

"At the end of the war the law provides that the foreign owner may sue in our courts within a year for a royalty for the use of that patent, and if he recovers, the law provides, however, that any defense which would ordinarily be made against such a suit shall be valid. In that case, if he should recover, then this 5 per cent fund that he has paid in, so far as it goes, shall be used to pay the judgment. And if he does not recover, or if during the year he does not bring suit, then the 5 per cent is to be refunded to the American user."

Railroads Ask for 15% Freight Increase

NEW YORK, Oct. 17—Eastern railroads are preparing to place before the Interstate Commerce Commission a program to provide general relief from their financial difficulties. The 5 per cent increase granted last month does not seem to be enough and it is planned to ask for a 15 per cent rate advance. The proposed increase will apply to traffic east of the Mississippi River and north of the Ohio. They would not effect, except indirectly and by combination, rates in other sections of the country.

Willys Western Maryland R. R. Director

BALTIMORE, Oct. 17—John N. Willys has succeeded George J. Gould as a director of the Western Maryland Railway Co. The resignation of Mr. Gould marks the passing of the influence of the Gould interests in this railroad.

Garrett with Federal Export Corp.

NEW YORK, Oct. 17—Carlton M. Garrett, formerly with the Western department of the Splittdorf Electric Co., the Moon Automobile Co., and the Cadillac Motor Co., has joined the motor department of the Federal Export Corp.

5-Ton Wilson Truck

DETROIT, Oct. 15—Due to the increased demand for trucks of large carrying capacities, the J. C. Wilson Co. will add a 5-ton model to their present line of 1-ton, 2-ton, and 3½-ton models about Jan. 1. The new model will follow closely the design of the present trucks.

May Exempt Skilled Labor

Shortage in Plants Is Apt to
Cause Use of Battalions
from Cantonments

WASHINGTON, Oct. 17—Labor shortage in industrial plants is apt to cause the War Department to send battalions from the army cantonment to the factories where they are urgently needed in addition. In the second draft it is said more liberal exemptions on account of industrial needs are expected. The War Department is having an industrial census of the army cantonments made and this census will also be taken at the time examinations for the second draft are on. In this way a record of all persons suitable for employment in industrial establishments such as the automobile industries, for instance, where the need for help is most urgent will be established. This situation may soon result in the creation of a War Service Labor Board to handle these problems. High government officials are strongly in favor of such a board.

Baker Against Drafting Men Between 18 and 40 Years Old

WASHINGTON, Oct. 16—Secretary of War Baker has put himself unreservedly on record in opposition to the plan of Representative Kahn of California and others to amend the draft law during the coming regular session of Congress in such a way as to include in draft age all males between 18 and 40 years of age inclusive. Secretary Baker's stand is primarily based upon the inroads which would be made upon industrial concerns where men up to and including 40 are included in the draft law. Secretary Baker also voiced the belief that the maximum age should have been fixed at 26 years as he said when 26 is reached the industrial element enters and he is less readily available for military duty.

Names of Companies with Government Contracts Held Secret

WASHINGTON, Oct. 17—The order of Secretary of War Baker to the effect that the names of corporations to which government contracts for army supplies are given shall not be made public has gone into effect. It is stated at the Council of National Defense, through Secretary Clarkson and the Committee on Supplies, that now "the lid is on" with respect to such orders.

Automotive Industries □

Oppose Price Fixing as Harmful

Committee of New York Business Men Go on Record as Averse to Measure

NEW YORK, Oct. 18—New York business men have placed themselves on record as opposed to any general plan of price fixing. At a hearing held at the headquarters of the Merchants' Association, the prevailing opinion was that if such a measure were carried out, it would do more harm than good. A hearing was given on seven proposals formulated by a committee of the Chamber of Commerce of the United States and submitted to the Merchants' Association of New York. The proposals recommended by the committee are:

1—To create authority to control prices during the war.

2—That authority to control prices should extend to all articles which have importance in basic industries as well as in war and which enter into the necessities of everyday life.

3—That authority to control prices should extend to raw materials and finished products.

4—That authority to control prices should extend to prices the public pays as well as those paid by the government.

5—That authority to control prices should be administered by a small executive board appointed by the board.

6—That an agency working in harmony with the board controlling prices should have authority to distribute available supplies to those purchasers whose needs are most directly related to the public welfare.

7—That each leading industry and trade should create a representative committee to represent it in conference and to advise with agencies that control prices and distribution.

R. H. Johnston, manager of the White Co., New York, presided and explained that the purpose of the meeting was to obtain the opinion of New York businessmen for the guidance of the committee in recommending how the association should vote on the proposition.

N. Y. and Chicago Automobile Salon Announced

NEW YORK, Oct. 17—The Automobile Salon will be held in the Grand Ball Room of the Astor, Jan. 2 to 9, and in the Elizabethan room of the Congress, Chicago, Jan. 26 to Feb. 2.

Space has already been taken for exhibits of the following makes: Rolls-Royce, White, Lancia, Locomobile, Simplex, Brewster, Daniels, Fergus, Murray, Cunningham, and Biddle. Brewster, Rubay, and Brooks-Ostruk have also taken space for body exhibits.

For the 1918 season both exhibitions will be under the same management.

The following officers were elected by the Automobile Salon: E. Lascaris, De Dion Bouton, president; T. E. Adams, Lancia, and Leon Rubay of the Rubay company, vice-president; R. W. Schuette, Rolls-Royce, secretary-treasurer.

Laurel Motors to Build Factory in Anderson

ANDERSON, IND., Oct. 16—The Laurel Motors Corp., which has taken over the Laurel Motor Car Co., has purchased a factory site in Anderson, Ind., and will erect a modern plant for the manufacture of Laurel cars and trucks, and expects to be operating the new plant about Jan. 1.

The Laurel Motor Car Co. has been manufacturing cars in Richmond, Ind., for the past 2 years and there has been a great demand for its cars. The new plant will enable the company to have a large production and take care of agents and territory with whom contracts previously could not be made on account of insufficient facilities to turn out cars. The company will use a new 16-valve motor designed by Robert M. Roof of Anderson, who built a 16-valve head for Ford cars.

The new model for 1918 will have 116 in. wheel-base and all the popular types of bodies will be furnished.

Pending the completion of the new plant the Laurel will be produced in temporary quarters at Anderson. It is estimated that the production for 1918 will be from 3000 to 5000 cars. The price has not yet been publicly announced but it is reported the car will be in the \$1,000 class.

Master Sells Its Rights

DETROIT, Oct. 15—The Master Carburetor Corp. has sold the manufacturing rights of its carburetor to a new company, the Master Carburetor Co. of Los Angeles, Cal. A new company is being organized to sell primers and it will be called the Master Primer Co. of Detroit. E. T. Daniels, secretary and treasurer, is the only one of the old Master organization that will be continued in the latter company.

Wescott Prices To Be Higher

SPRINGFIELD, OHIO, Oct. 16—The prices of all Wescott cars advanced Oct. 31 as follows:

Model	Old Price	New Price
Seven or Five Passenger Touring Car.....	\$1,790	\$1,940
Four Passenger Touring Roadster	1,790	1,890
Seven or Five Passenger Convertible Sedan.....	2,690	2,790
Four Passenger Convertible Coupe	2,690	2,790

F.O.B. Springfield, Ohio.

Tax Not Disturbing Manufacturers

Steps Being Taken for Dealers To Add It To Their Selling Price

DETROIT, Oct. 15—In practically every case, motor car manufacturers state that the 3 per cent tax has had but little effect on the industry, and are taking steps to have the dealer add the tax to the wholesale cost of the car in the same manner as is done with freight charges. In some quarters, the fear is expressed that dealers may be prevailed upon by clever buyers to stand the tax personally. To prevent this, the Paige Motor Car Co. has sent a letter to all of its dealers, absolutely forbidding them to pay the tax themselves, and charging them to collect it from the purchaser. Included in this letter is a price list of all the Paige models, together with the amount of the tax in each case. Other manufacturers stated that while the tax might slow up business slightly, the effect would not be permanent, and they too are passing the tax on to the consumer in accordance with the law. In fact, realization that the tax is a necessary war measure, and realization that the dealer must collect all of the tax from the purchaser, and not attempt to stand even part of it himself, seems to sum up the attitude of the manufacturers. One manufacturer that is to announce a new model in about a month states that the advertising on the new car will contain the list price of the car, and a separate item will show the amount of the war tax—stating that that amount is a war tax, and must be paid by the purchaser. This will tend to impress upon the public that they must pay the tax, and prevent them from attempting to get the dealer to stand the tax.

\$60,000,000 Business in 1917 for Firestone

AKRON, Oct. 16—According to an estimate made by H. S. Firestone, of the Firestone Tire & Rubber Co., the company will do a \$60,000,000 business this year. This will mark an increase of over 100 per cent above the business done last year and the following table will show in brief the progress of the company since 1904:

Year	Amount of Business	Cars Running	Business Per Car
1917....	\$60,000,000*	3,500,000	\$17.10
1916....	36,000,000	1,753,000	20.50
1915....	5,300,000	350,000	15.10
1906....	1,000,000	80,000	12.50
1904....	460,000	30,000	15.30

*Estimated.

Burton Process for All

Agitation by Government to Increase Supply of Gasoline May Result in Its Use

CHICAGO, Oct. 16—Apparently, agitation and the appeal of the government to increase the supply of gasoline during the period of the war are beginning to bear fruit. Development indicates that the Standard Oil Co. of Indiana which holds the Burton process of pressure distillation by which the gasoline is greatly increased, may release this process to independent refiners. Standard Oil officials, however, will not comment on the situation, but prominent independents feel that the prospects are bright for the accomplishment of this result.

According to the majority of the independents, these companies are so situated that the Burton process can be incorporated in their refineries by a slight addition to present equipment. There have been reports that the Standard Oil Co. has made tentative proposals to some independent refineries for the use of the process. But in one case, the royalty was prohibitive and in another the stipulation was that the independents must not use the process in fields where the Standard Oil Co. is operating, thus leaving a rather limited market.

Would Double Supply

One of two things would happen if the process were released for general use. The present supply of gasoline would be practically doubled, probably resulting in the reduction of prices, or less crude would be worked, conserving the supply, which in turn would tend to prevent an increase in prices.

An analysis of the gasoline situation at present shows that more crude is being worked than produced. In ordinary refining, about 25 per cent lubricating oil is produced, 20 per cent gasoline, and allowing 5 per cent waste, there remains 50 per cent of residual fuel oil, a heavy product which still contains a certain percentage of gasoline.

By the Burton process it is possible to break up or crack this heavy substance so that an additional 20 per cent of gasoline is secured. It is stated that the general use of the Burton process might mean a total increase of about 75 per cent in gasoline production.

(Continued on page 695)

Success Marks Boston's First Enclosed Car Show

BOSTON, Oct. 13—Boston's first Enclosed Car Show Week has been quite successful. It has sold a lot of enclosed cars, created interest and talk and drawn a lot of people to showrooms. The exhibition was sponsored by the Boston Automobile Dealers' Assn. and was brought to a close tonight after a week's run. Every member of the association, and a num-

ber who are not members, decorated his salesroom and arranged a special display of enclosed cars. Invitations were sent out by the association to 35,000 car owners in New England. In spite of rainy weather during the first part of the week, dealers express themselves as quite satisfied with the attendance and with the number of sales made. In all probability the event will be repeated next year.

Studebaker Subscribes \$1,000,000 to Liberty Loan

SOUTH BEND, IND., Oct. 15—The Studebaker Corp. last week subscribed \$1,000,000 to the second Liberty Loan, the largest single contribution that has been made in Indiana since the campaign was started.

M. & A. M. Convention Speakers Announced

NEW YORK, Oct. 15—The Motor & Accessory Manufacturers has announced the speakers at its convention to be held by the Credit department Oct. 18 in Cleveland at the Hollenden Hotel. They are as follows:

L. H. Lyons, creditor manager, Westinghouse Electric & Mfg. Co.
F. B. Snyder, vice-president, First National Bank, Philadelphia.
J. M. McComb, assistant treasurer, Crucible Steel Co. of America.
H. H. Herrick, general credit manager, Armour & Co.
Roy D. Chapin, president, Hudson Motor Car Co.
A. C. Bagley, credit manager of the Association.

Waldon to Go to Europe

WASHINGTON, Oct. 15—Major Sydney Waldon, of the Signal Corps Reserves, it is reported, is soon to be sent to Europe on an important mission.

Ford Closed Car Prices Raised

DETROIT, Oct. 16—The Ford Motor Co. has increased the prices on all its enclosed models due to the increased cost of material. The new price of the coupelet is \$560, the former price being \$505; the sedan, \$695, the old price being \$645; the town car, 640, former price being \$595. There has been no advance in other models.

Cadillac Prices Raised

DETROIT, Oct. 16—The Cadillac Motor Car Co. has revised the prices of its line as follows.

Model	Old Price	New Price
7-pass. phaeton	\$2,590	\$2,805
Roadster	2,590	2,805
Victoria convertible	3,075	3,205
Brougham	3,535	3,650
Town limousine	4,100	4,160
Town landaulet	4,250	4,310
Limousine	4,085	4,145
Imperial	4,285	4,345
Landaulet	4,235	4,295
125-in. chassis	2,295	2,340
145-in. chassis	2,345	2,395
132-in. chassis	2,375	2,425
145-in. chassis	2,415	2,465

These new prices include the regular standard equipment, f.o.b. Detroit. The purchaser pays the war tax in addition.

Mitchell Gets F W D Truck Order

Working on Government Contract Received by Four Wheel Drive Co.

CHICAGO, Oct. 16—It has just become known that the Mitchell Motors Co., Racine, Wis., has been licensed by the Four Wheel Drive Co., Clintonville, Wis., to make trucks for the Government. Mitchell becomes a sub-contractor, licensed by the Four Wheel Drive Co., under the contract which the latter company received direct from the Government. Mitchell has been working on its contract for several weeks.

The exact volume of contract has not been determined, but the companies licensed by Four Wheel Drive will share alike, and the amount of contract will be limited only to the number of trucks each can produce. Mitchell, along with another who has been licensed, has no contracts directly with the Government but works through a licensing company. These sub-contracts call for completed trucks.

Mitchell has built a substantial addition to its plant, in order to handle this war business. Hence this will not influence production of passenger cars. The new plant for the building of war trucks is ready for occupancy and the exact amount of the contract both with Mitchell and with others will be known within a few days.

\$6,000,000 Government Parts Order for F W D

CLINTONVILLE, WIS., Oct. 13—The Four Wheel Drive Auto Co. has received an order from the Government for spare parts for F. W. D. army trucks, amounting to nearly \$6,000,000. Delivery is to be made with the 3750 class B trucks which the company is now building for the Government.

Captain Walter R. Metz, of the Quartermaster's Department, who has been stationed at the Clintonville plant for some time past as inspector, has been detailed for duty at the Pierce-Arrow plant in Buffalo. Captain Charles P. Daly has been detailed to the F. W. D. works.

New Jersey Will Have No Grade Crossings

TRENTON, N. J., Oct. 12—New Jersey is promised the entire elimination of railroad grade crossings, according to a decision of the Court of Errors, in which it was declared that the New Jersey grade crossing law was constitutional, the court affirming the decision of the Supreme Court holding the order of the Board of Public Utility, requiring the Erie Railroad Company to do away with its grade crossings in the city of Paterson. Other cities having grade crossings will probably take advantage of this decision.

100,000 Cars for Canada

**Third Largest Automobile User
—One Car to Every 33 People
—Wants Small Cars**

TORONTO, ONT., Oct. 15—Proof of the ever-growing popularity of the automobile throughout Canada is contained in figures representing the number of licenses issued for this year as compared with previous years, and it is becoming increasingly evident that the automobile industry is being established upon such a basis that it will always be regarded as Canada's "leading peace time industry." In 1913 the number of registered cars in Canada had been increased by 16,780, or 38 per cent, as against the 1912 registration, and during 1914 it was increased by 22,070, or 36 per cent, as compared to 1913. After three years of war it is estimated that Canada this year is purchasing 100,000 new cars, almost five times as many as in 1914, and an increase of 85 per cent, over the normal increase for 1913 and 1914.

It is evident, therefore, that Canada, with a population of slightly over 7,500,000 possesses over 150,000 cars, which means there is one for every fifty of the population. Ontario is the leading province with about 75,000, or one to every thirty-three of population.

In addition to the actual manufacture of cars, there are a number of subsidiary industries affected by the growth of the automobile trade. Each of these adds in a greater or less degree to the annual turnover and it is probably safe to say that the aggregate trade created through the production and operation of motor-propelled vehicles in Canada for the year 1917 will amount to nearly \$1,000,000. Among the nations of the world Canada now occupies the third position with regard to the number of automobiles in

(Continued on page 696)

Republic-Knight Tire Production To Be Increased

YOUNGSTOWN, OHIO, Oct. 12—Details of the formation of a new rubber company, which is to take over the properties of the Republic Rubber Co., of this city, and the Knight Tire and Rubber Co., Canton, are announced by Guy E. Norwood, president of the new corporation, to be known as the Republic Rubber Corp., incorporated in New York, with an authorized capital of \$10,000,000 preferred stock, divided into 100,000 shares, with a par value of \$100.

Production of the new Republic plant here will be increased from 2000 tires a day to 3000, while the truck tire capacity will be tripled. The output of the Knight plant, at Canton, will be increased from 600 tires daily to 1000.

Common shareholders of the Republic Rubber Co. will receive in exchange for their present shares five shares of the new par value common stock of the new corporation for each share of the

old Republic common stock. Common stockholders of the Knight company will receive two and one-tenth shares of the common stock of the new corporation for one of the old Knight common. All fractional shares resulting will be adjusted on a basis of \$35 a share for the new common.

Mr. Norwood stated that the preferred shareholders of the Republic and the Knight companies may convert their present holdings of preferred stock into an equivalent number of shares of the new company. The new preferred will be 7 per cent cumulative, while the new common will not pay less than the rate which Republic common has paid, which would equal \$1.60 a share for the new issue.

Emerson Motors Assets Transferred to Campbell M. C. Co.

NEW YORK, Oct. 12—The Campbell Motor Car Co., a new corporation, will take over the assets of the Emerson Motors Co., according to a transfer signed by Judge Manton in the Federal District Court. This is in accordance with a plan of reorganization agreed to by Louis H. Moos, counsel for the stockholders of the Emerson corporation, against which they had filed a petition in bankruptcy.

Since the petition in bankruptcy was filed against the company representatives of the stockholders and of the company have been working to reorganize it. As part of their plan, which will now be carried through as the result of Judge Manton's order, creditors are to receive payment in full in common stock and secured preferred stock in the new corporation.

No more stock will be sold, according to the management, but an aggressive manufacturing campaign will be started in the near future.

Bethlehem Motors Marketing Tractor and Trailer Equipment

ALLENTOWN, PA., Oct. 16—The Bethlehem Motors Corp. has placed on the market a new tractor and trailer equipment which is to be sold either as a unit including the tractor, a fifth wheel and trailer outfit at \$2,565 or the tractor unit alone, at \$1,865. The tractor unit has a power take-off from the transmission and is designed to take any type of truck body with a hoist to be operated by the truck motor. Any make of power hoist can be installed.

Model B1 is a tractor and trailer outfit, the tractor having a wheelbase of 120 in. and the total capacity of both units being 5 tons. The length of the trailer body may be 14, 16 or 18 ft. The trailer is fitted with 6-in. single tires and has the same wheels and rear axle as used on the standard 2½-ton Bethlehem. The fifth wheel is manufactured by the company.

Short turning radius and ability to back against the curb without blocking traffic are features which are emphasized.

To Make Stewart Starters

**National City Bank Interests
Organize Motor Starter Corp.
Capitalized at \$2,000,000**

NEW YORK, Oct. 12—National City Bank interests have organized a company to acquire the patents of Henry K. Stewart, one of the founders of the Stewart-Warner Speedometer Corp. The new concern, known as the Motor Starter Corp., was incorporated at Albany yesterday with a capitalization of \$2,000,000. It will take over the Henry K. Stewart plant in Long Island City and will make other electrical equipment.

The directors of the new company follow: Richard Delafield, Frank A. Vanderlip, president of the National City Bank, and Charles V. Rich and Samuel McRoberts, vice-presidents. Other directors include Sylvester W. Labrot, Charles P. Northrop, Eric P. Swenson, S. M. Swenson and Richard H. Williams.

New Turn in Munger Rim Case

NEW YORK, Oct. 13—A new turn in the suit of Louis de F. Munger against the Perlman Rim Corp. has been brought about by new testimony from the Perlman company, which states that Mr. Munger is not the owner of the rim patent No. 638,588, upon which he sues. The court has vacated the judgment in favor of Mr. Munger and has set aside Oct. 29, next, as the date for the determination of the patent title ownership. The Perlman lawyers claim that the Munger patent is owned by H. F. Herbermann, an attorney, who bought it from a Philadelphia junk dealer on Sept. 20 last, who has owned it since 1903, when he took over the assets of the Munger Automobile Tire Co., which failed. According to testimony, the Munger Automobile Tire Co. at that time had in its possession the patent involved, which had been transferred to it by the National Wheel & Tractor Co., of which Mr. Munger was president.

Curtiss Building Large Flying Boats

BUFFALO, N. Y., Oct. 15—At one of the plants of the Curtiss Aeroplane and Motor Corporation in this city work is progressing on two huge flying boats having a wing spread of 90 ft. They are of triplane construction and carry a substantial boat which is to be manned by four or five men. These flying boats are being built for patrol service and will be armed each with a 3-in. gun. Sunbeam engines are being fitted and a speed of 90 m.p.h. is contemplated.

Springfield Airplane to Use Liberty Motor

SPRINGFIELD, MASS., Oct. 15—The Springfield Airplane Corp., with J. S. White, president, has entered the field in Washington for Government work. It will use the Liberty motor.

G. M. Profits Up 46.5 Per Cent

September Sales Total 16,923
or 3,043 Greater Than Same
Month in 1916

NEW YORK, Oct. 12—Undivided profits of \$3,225,000 were made by General Motors in September, compared with \$2,200,110 in the same months of 1916, an increase of \$1,024,890, or 46.5 per cent. The number of cars and trucks sold last month was 16,923, compared with 13,880 in September, 1916, an increase of 3043. Net sales for September totaled \$16,850,000 against \$11,557,061 a year ago, an increase of \$5,292,939.

Cash in the bank and sight drafts with documents attached at the close of business Oct. 8, 1917, amounted to \$22,043,500.

The results of September this year compared in tabular form with September, 1916, are as follows:

	Sept. 1917	Sept. 1916	Increase
Cars and trucks sold	16,023	13,880	3,043
Net sales	\$16,850,000	\$11,557,061	\$5,292,939
Undiv. profits	3,225,000	2,200,110	1,024,890

Profits of \$3,225,000 for General Motors in September are equal to 3.9 per cent for the month on the common stock outstanding. August profits were reported as \$3,150,000, an increase of 45 per cent over August, 1916, and equal to 3.8 per cent on the common stock.

Thus in August and September, the first 2 months of the new fiscal year, the company has earned a surplus equal to 7.7 per cent on its common stock, or almost two-thirds of the entire year's dividend requirements at the present 12 per cent rate.

40,000 Republic Trucks for 1918

ALMA, MICH., Oct. 16—The Republic Motor Truck Co. will manufacture 40,000 trucks during the coming year, according

12 Points on Tax Handling

(Continued from page 668)

articles where there is a reasonable doubt as to whether a tax should be paid a separate list should be made and with this there should go an explanation giving the reasons why the tax apparently should not be paid. In other words, where there is a doubt the Government should first be asked as to the proper procedure. This will give the Government all needed information and will obviate the possibility of penalties.

12—Nothing very definite has been decided as to when and how taxes should be made. It has been suggested that the business of each calendar month be reported and it is provided that thirty days are allowed to file reports. It is understood that fifteen to thirty days will be allowed to pay the amount due the Government. All these matters can be adjusted with local collectors of internal revenue.

to the plans of the production department. In order to care for this increased production, additions to the plant are now under way which will increase the shop floor space by 70,000 sq. ft. The production from Jan. 1, 1917, to July 1 shows that 9677 trucks were produced, which is 3600 more than was produced in the same period of 1916, and the planned increase for 1918 shows a still greater increase.

At present 1500 men are employed and this amount is more than twice that of a few months ago.

Ford Smelting Plant Ready in 1920

DETROIT, Oct. 16—It is estimated that at the present rate of progress the Ford smelting plant will be completed and in operation by the first part of 1920. Much of the output of this plant will doubtless be used by the Ford Motor Co. and by the tractor plant of Henry Ford & Son.

The buildings at the plant are practically without exception of concrete and brick construction, cover a tract of land nearly a mile long, and will employ, it is said, about 100,000 persons.

Fisher Body Co.'s Work Delayed

BUFFALO, Oct. 17—Pending the arrival of stampings, work on the Fisher airplane will be held up for a few days. The first airplane is partly assembled and within 2 weeks production should be begun. With the completion of the first ten airplane units it is expected that the output will reach fifty per week.

Lack of Machinery Holds Up Lincoln

DETROIT, Oct. 17—Due to the slow arrival of machinery at the Lincoln Motors Co.'s plant production has been delayed. The plans of the company, however, are progressing rapidly, and it is expected that production on airplane engines will be under way in 3 weeks.

Stewart Acquires 10-Acre Site

CHICAGO, Oct. 16—The Stewart Mfg. Co., maker of parts for automobiles, has acquired a 10-acre factory site on the northwest side of this city and will build a factory 300 ft. square. The company employs 700 men and has outgrown its present quarters.

Redden Office Transferred to Jackson

CHICAGO, Oct. 17—From authentic sources it is reported that the office of the Redden Motor Truck Co. will shortly be transferred to Jackson, Mich. The accounting department has already been there for the past 3 months.

Gorey Enlarges Scope

NEW YORK, Oct. 16—Joseph C. Gorey has just received the Eastern agency for the Sterling joint. This together with the Spicer Mfg. Co. The Hartford Auto Parts Co. has placed him in a position to supply all or any universal joint to fit any car.

Portage to Increase Capital

To Provide for Future Growth
—Will Decide at Meeting
on Nov. 20

BARBERTON, OHIO, Oct. 13—Directors of the Portage Rubber Co. at a meeting held Oct. 5 passed a resolution calling a special meeting of stockholders Nov. 20 for the purpose of increasing the authorized capitalization to \$10,000,000, half common and half preferred stock. According to the treasurer's report the \$500,000 common and \$500,000 preferred recently offered to stockholders has all been subscribed, and over half of the stock had been paid for in full instead of in four installments as was permissible.

The increase to be voted on is to provide for future growth, and it is desired that the stockholders waive their rights to subscribe for any part of the increased authorization. This is done so that in the future the preferred can be sold to the general public without asking stockholders to purchase from time to time; and it is not the intention of the company to sell any more common stock, except a certain amount that is to be set aside and sold to employees on an installment plan.

Due to the effect that business has been practically doubling each year, the officers state that the outlook for the coming season is bright and will doubtless surpass all past records. At this meeting the directors passed a resolution to pay holders of common the regular 3 per cent quarterly dividend Nov. 15 on stock of record Nov. 5 and a regular quarterly dividend of 1½ per cent on preferred Jan. 1 to stock of record Dec. 20.

First Dachel-Carter Submarine Chaser Built

PETOSKEY, MICH., Oct. 15—The Dachel-Carter Boat Co. has manufactured its first big submarine chaser for Government service. The chaser is built along standard lines, 60 ft. long by 11 ft. beam, by 3½ ft. depth. Built and designed for speed and stability, the boat is expected to make a pace of between 20 and 25 m.p.h. A 600-gal. tank will carry fresh water. The forward deck is strongly reinforced to bear the strain of a rapid-fire gun, which will be mounted there.

Norwegian Engineers Form Association

DETROIT, Oct. 15—The American Engineers of Norwegian Descent has been organized in this city and includes many prominent engineers in the chemical field, numbering among its members Peter S. Steenstrup, head of the General Motors Export Co., and John Erickson, city engineer of Chicago, who is associated with the Air-O-Flex Automobile Corp.

Burton Process for All*(Continued from page 692)*

If the process were released so that all of the refiners would use it, one of two things would happen:

1—The present supply of gasoline would be increased from 75 per cent to 100 per cent without increasing the quantity of crude oil being worked for gasoline.

2—Present gasoline yield could be obtained by working perhaps one-half the present amount of crude.

In either event this should lower the price of gasoline or at least prevent it from rising higher. Analysis of the gasoline situation at the present time shows that more crude is being worked than is produced. A more important effect than that of decreasing the price probably would be the conservation of the crude supply.

In ordinary refining without the use of a re-distillation process, such as the Burton process, the crude produces about 20 per cent gasoline, 25 per cent of light oil and 5 per cent waste. There remains 50 per cent of fuel oil—a heavy product which contains many molecules of gasoline. With the Burton process this heavy product is broken up so that an additional 20 per cent of gasoline is secured. In other words, the gasoline production is doubled from a gallon of crude. Actually if all the refiners were to use the Burton process and if all the crude were to be so treated, it might mean a total increase of gasoline production of about 75 per cent.

It must be borne in mind that fuel oil is an important product and particularly in oil-burning engines for marine service, so that it is not logical to expect that all of the fuel oil would be treated for its extra content of gasoline.

No Stability in Stock Prices**Tire Issues Lead in General Decline—Many Taking Advantage of Low Prices**

NEW YORK, Oct. 17—Few gains were made last week in the automotive and allied securities. In fact the whole market was affected by the liquidation and sudden drop in other securities. Tire issues featured the decline in the automotive issues, their recessions ranging from 2 to 10 points. Just why tire issues should be weak is not known, for the companies are showing record earnings, as shown in the U. S. Rubber earnings last week.

Automobile issues declined from a fraction to 6 points. Curtiss Aeroplane was stronger last week and recorded a gain of 5 points. Peerless Truck showed a rise of 3 points to 10.

U. S. Rubber Sells \$40,000,000 Worth of Tires in 8 Months

NEW YORK, Oct. 15—As reported, the United States Rubber Co. is having the biggest year in its history. Its total sales in the first 8 months of 1917 amounted to \$105,000,000, of which the tire department contributed about \$40,000,000. It is predicted that this department may show sales close to \$60,000,000 for the entire year.

Defiance Machine to Increase

DEFIANCE, OHIO, Oct. 16—The Defiance Machine Works has increased its capitalization from \$600,000 to \$1,200,000, to care for plant extensions and increased

production. Several big Government contracts have been secured for airplane engines and parts; tractor, automobile and motor boat engines will be manufactured in addition to the usual line of wood-working machinery. Work is being rushed on additions to the plant, the first of which will extend from Third to Fourth Street on Jackson Avenue.

Kelly-Springfield Tire's Record Earnings

CHICAGO, Oct. 16—September gross and net earnings for the Kelly-Springfield Tire Co. are the largest of any month in the company's history. After allowing for usual dividends on preferred and common stocks, the surplus this year is expected to reach \$1,500,000.

Studebaker Reduces Floating Debt

SOUTH BEND, IND., Oct. 15—The Studebaker Corp. reports financial improvement. It is understood that on Oct. 1 the company had reduced its floating debt to about \$10,500,000, a cut of better than \$2,500,000. The company on July 1 had notes payable of \$13,231,500. This was an increase of \$9,231,000 over the notes debt at the end of the 1916 year, Dec. 31.

DIVIDENDS DECLARED

Willys-Overland Co., quarterly of 75 cents per share, payable Nov. 1 on all outstanding common capital stock, payable to all common stockholders of record at the close of business Oct. 24.

Packard Motor Car Co. cash dividend of 2 per cent on common, payable Oct. 31 to holders of record Oct. 16.

Automotive Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Net Ch'ge
*Ajax Rubber Co.	54	57	—5
*J. I. Case T. M. Co. pfd.	79	82	—1
Chalmers Motor Co. com.	2	5	..
Chalmers Motor Co. pfd.	..	..	..
*Chandler Motor Co.	72	73	—1
Chevrolet Motor Co.	70	73	—1
Curtiss Aeroplane	35	33	+5
*Fisher Body Corp. com.	25	35	..
*Fisher Body Corp. pfd.	82	87½	—4
Fisk Rubber Co. com.	50	60	—10
Fisk Rubber Co. 1st pfd.	100	105	—2
Fisk Rubber Co. 2nd pfd.	85	95	—5
Firestone Tire & Rubber Co. com.	107	111	+1
Firestone Tire & Rubber Co. pfd.	100	102	..
*General Motors Co. com.	92	92½	—2½
*General Motors Co. pfd.	73¾	75½	—4
*B. F. Goodrich Co. com.	41¼	41½	—¾
*B. F. Goodrich Co. pfd.	100	103	..
Goodyear Tire & Rubber Co. com.	170	175	—4
Goodyear Tire & Rubber Co. pfd.	100	102	..
Grant Motor Car Corp.	2	4	..
Hupp Motor Car Corp. com.	2½	3½	..
Hupp Motor Car Corp. pfd.	82	88	..
International Motor Co. com.	8	12	..
International Motor Co. 1st pfd.	..	50	..
International Motor Co. 2nd pfd.	15	40	..
*Kelly-Springfield Tire Co. com.	40½	42	—1½
*Kelly-Springfield Tire Co. 1st pfd.	85	90½	..
*Lee Rubber & Tire Corp.	16½	17	—½
*Maxwell Motor Co. Inc. com.	31¾	32¾	—¾
*Maxwell Motor Co. Inc. 1st pfd.	64	65	—1
*Maxwell Motor Co. Inc. 2nd pfd.	17	20	—2½
Miller Rubber Co. com.	165	175	—5
Miller Rubber Co. pfd.	100	102	..
Packard Motor Car Co. com.	143	148	..
Packard Motor Car Co. pfd.	94	98	..
Paige-Detroit Motor Car Co.	23	25	..
Peerless Truck & Motor Corp.	10	13	+3
Portage Rubber Co. com.	120	125	—3
Regal Motor Car Co. pfd.	15	20	..
Reo Motor Car Co.	23	24	—1
*Saxon Motor Car Corp.	11	13	—1

	Bid	Asked	Net Ch'ge
Springfield Body Corp. com.	..	..	..
Springfield Body Corp. pfd.	..	..	..
Standard Motor Construction Co.	8	9	—4
*Stewart-Warner Speed. Corp.	56	57	—6½
*Studebaker Corp. com.	39½	40½	—6
*Studebaker Corp. pfd.	..	90	..
Submarine Boat	15½	14	—¾
Swinehart Tire & Rubber Co.	40	50	..
United Motors Corp.	19½	20	—1½
*U. S. Rubber Co. com.	56½	57	—¾
*U. S. Rubber Co. pfd.	98	101	—3½
*White Motor Co.	39½	39¾	—1½
*Willys-Overland Co. com.	23¾	23¾	—1½
*Willys-Overland Co. pfd.	..	87	..
Wright-Martin	9½	8½	—1½

*At close October 15, 1917. Listed New York Stock Exchange.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE ACTIVE STOCKS

	Bid	Asked	Net Ch'ge
Auto Body Co.	..	10	..
Bower Roller Bearing Co.	28	30½	—¾
Chevrolet Motor Co.	73	78	—4
Commerce Motor Car Co.	..	..	..
Continental Motor Co. com.	5½	6½	—¾
Continental Motor Co. pfd.	..	..	..
Edmunds & Jones com.	..	40	..
Ford Motor Co. of Canada.	214½	..	+2½
Hall Lamp Co.	..	21	..
Michigan Stamping Co. com.	..	..	..
Motor Products	..	..	..
Packard Motor Car Co. com.	..	135	..
Packard Motor Car Co. pfd.	..	96	..
Paige-Detroit Motor Car Co.	..	24½	..
Prudden Wheel Co.	..	18½	..
Reo Motor Car Co.	..	24½	..

INACTIVE STOCKS

	Bid	Asked	Net Ch'ge
Atlas Drop Forge.	..	35½	..
Kelsey Wheel Co.	82	..	..
Regal Motor Car Co.	..	26½	..

Industrial Review of the Week

A Summary of Major Developments in Other Fields

Coal Shortage Due to Industrial Activity

So much is being said about the shortage of bituminous coal, and the general public realizes so little the important gains in output made by the operators under trying conditions, last summer, over all previous records, that the statement just issued by the United States Geological Survey, Department of the Interior, on production in 1917 compared with 1916 is particularly timely. In commenting on this report, prepared by the statisticians of the Geological Survey, Director Geo. Otis Smith points out that the shortage is not due to the failure of the soft-coal mines to produce more coal than in the past, for the country on September 1 was about a month ahead of last year in output and is expected to finish the year with an increase of 10 per cent over 1916, the banner year, and of 25 per cent over 1915.

The tremendous increase in manufacturing and transportation activity this year has created a demand for soft coal in excess of any in the past, an increase in demand that is difficult to measure in terms of tons but that is certainly more than the 10 per cent by which production has increased. To meet this demand the mines have been producing soft coal at a rate never before equaled. In the second week of July, 1917, the average daily production was more than 1,900,000 tons, the highest point yet attained; in the middle of August the lowest rate for the summer, 1,638,000 tons, was recorded; and in the last week of September the daily rate was 1,823,000

A New Service

Herewith THE AUTOMOBILE AND AUTOMOTIVE INDUSTRIES supplies for the benefit of its readers a general summary of important developments in other fields of business. This is rendered possible by the editorial co-operation of leading industrial publications which are recognized authorities.

By compressing the general industrial situation into this form we hope to give our readers a clear and comprehensive idea of up-to-the-minute developments which they could otherwise secure only with considerable expenditure of time and effort.

tons. In the first eight months of 1917 the output of soft coal was 363,500,000 tons, or 37,000,000 tons more than in the first eight months of 1916. In the same period shipments of anthracite increased 16 per cent over those of 1916.—U. S. Geological Survey Bulletin.

Middle West Has Coal Famine

Everywhere except in the Northwest there appears to be a marked scarcity of bituminous coal. For weeks appeals for fuel have been pouring into Washington with no adequate relief from the situation. A general scarcity of miners, a shortage of cars, an abnormal industrial demand and various labor troubles throughout different parts of the country have contributed to this condition. The manufacturing towns of Ohio, Indiana

and southern Michigan appear to be in particular need of fuel. Many municipal and industrial plants throughout this region, in the smaller towns particularly, have been obliged to shut down on account of fuel scarcity. This is true alike of districts almost within the coal-producing region as well as those lying remote from the mines. The prices at the mines are, of course, in accordance with the Government schedule, but no coal is to be had, or practically none. A few sales have been reported on the \$2 basis and a few contracts have been closed at that figure, but the great volume of the tonnage still moves upon contract, and spot coal in the open market has disappeared. The resumption of work in the eastern Kentucky-Tennessee field after a shutdown of a few weeks because of a strike in that region has been the cause of considerable rejoicing among coal dealers and consumers, and will possibly relieve somewhat the tensity of the situation in southern Ohio. The priority order as it affects shipments of coal to the Northwest has also been a potent factor in the coal shortage of other central regions. It is believed that with the closing of navigation the considerable volume of Lake coal, which has assumed record proportions during the recent past, will be diverted to local consumers, relieving their strenuous needs.—Coal Age.

Deadlock in Steel Industry

United States Steel Corporation reports that unfilled orders on hand September 30 amounted to 9,833,477 tons,

100,000 Cars for Canada

(Continued from page 693)

actual use. Since the industry has come under the stimulus of war business, it bids fair to become, as it has become in the United States, one of the greatest factors in the industrial development of the country. There are now in Canada twelve car companies in active operation with an estimated output for the current year approximating in value \$50,000,000.

In making a comparison with the United States, the latest compilation of figures shows that there are fourteen States of the American union where there are fewer cars in proportion to population than there are in Ontario; and in making a comparison of figures it must be remembered that the initial cost of the automobile and upkeep cost is 42 per cent higher in Canada than in the United States.

Western Canada, during the past two seasons, has proved a veritable gold mine for automobile agents, as the Western farmers are becoming more and more educated to the use of up-to-date facilities. Even British Columbia, with a

thin population less than that of the city of Toronto, scattered over wide areas of mountainous country, has automobiles in the proportion of one to every seventy-eight of the population.

Indicating the trend of the buying mind is the fact that fully 15,000 of the increase of 23,000 cars in Ontario, were priced under \$1,500, indicating that the public is going in for a small car with a high mileage and small tires now that prices of gasoline and tires have increased at such an alarming rate. A conservative estimate of the amount of money invested in private cars in Canada has been placed at \$135,000,000. The industry is still in its infancy. The growth of the automobile industry is truly significant, as indicated by the foregoing statistics. Canada has been a heavy importer of cars, tires and parts from the United States. The following statistics taken from government blue books, are interesting. Figures are available only up to March of the present year. Since that time it is estimated by competent authorities that the in-

creases have been greater than in any corresponding period.

From the United States, during the six years ending March, 1917, Canada's imports of automobiles amounted to \$40,634,125, as follows: In 1912, \$6,077,497; in 1913, \$9,233,171; in 1914, \$6,459,346; in 1915, \$4,532,138; in 1916, \$5,790,498; in 1917, \$8,555,475. Note the big increase of imports of automobiles for 1917 over 1916.

From the United States, during the six years ending March, 1917, Canada's imports of automobile accessories amounted to \$17,051,975, as follows: In 1912, \$854,000; in 1913, \$762,321; in 1914, \$3,965,173; in 1915, \$2,139,552; in 1916, \$4,693,003; in 1917, \$7,173,423. Note the big increase of imports of automobile parts for 1917 over 1916.

From the United States, during the six years ending March, 1917, Canada's imports of automobile tires amounted to \$7,068,513, as follows: In 1912, \$666,411; in 1913, \$1,507,916; in 1914, \$1,263,382; in 1915, \$1,044,592; in 1916, \$1,389,400; in 1917, \$1,217,532.

a decrease of 573,572 tons, as compared with 10,407,049 tons on hand August 31. Unfilled tonnage on July 31 amounted to 10,844,164 tons; on June 30, 11,383,287 tons; on May 31, 11,886,591 tons; and on September 30, 1916, 9,552,584 tons. The falling off of 573,572 tons in the bookings of the United States Steel Corporation in September was somewhat larger than expected. However, as long as consumers and producers are dead-locked on prices and deliveries, there is no reason to expect any increase in unfilled tonnage. For the past several months unfilled steel tonnage has been declining, due largely to haggling over steel prices. Prices of certain products have been fixed, but no definite action on material other than plates, shapes, bars and pig iron has been taken. Steel manufacturers have declined to sell steel at the prices fixed by the Government, and consumers who have already contracted for steel at prices far above the Government figures are not specifying very freely. Manufacturers and consumers agree that many problems will yet have to be solved before stability is again injected into the industry.—*Wall Street Journal*.

State Prisoners Efficient Road Builders

Following the success of the prison road camp in Montgomery county, a number of other counties in Missouri are making inquiry as to the terms and conditions under which prison labor may be obtained. The new prison law provides that state prisoners cannot be employed on contract work, but they can be furnished to counties doing work by force account at a price agreed upon by the State Prison Board and the State Highway Department. The price of this labor for the present has been fixed at \$1.25 per day, the cost of transporting, boarding and housing the prisoners being borne by the State Prison Board. Counties and road districts are required to provide machinery and arrange for necessary teams, etc.

This form of labor is very attractive to counties, since the prisoners are faithful and efficient workers, and because there is a general scarcity of local labor for road building at this time. A well organized prison road camp provides a force that soon becomes skilled in the operating of machinery and can thereafter be depended upon. This enables the county or road district to proceed with plans for construction with the assurance that labor at a fixed price will be available to execute the work satisfactorily. Application for prison labor should be made through county courts to the State Highway Department and the State Prison Board.—*Missouri State Highway Department*.

School for Starting-Lighting Systems

FLINT, MICH., Oct. 12—A course in starting, lighting and ignition systems has been started by the Industrial Fellowship League school of automobile trades. The course will cover the theory and service common to all systems with particular study of the Delco, Auto-Lite, Westinghouse, Gray-Davis and Bijur.

South and Mid-West Want Cars

Demand Increases from Those Sections—Companies Preparing for Big Business There

DETROIT, Oct. 9—An increased demand for cars from the South and Mid-West section of the states has been particularly noticeable during the past two weeks. This demand not only extends to cars of the little price class, but is also noticed in the used car markets.

The Columbia Motors Co. is holding a convention of officials from all companies manufacturing parts entering into the Columbia cars. The purpose of this convention is to double the allotment of parts if possible.

Because of this demand the Columbia company is now sixty days behind schedule and if additional contracts can be secured will double its present production of twelve cars per day.

The Saxon Motor Car Co. has received 2400 orders during September. These orders are well divided between the touring car and roadster and a marked increase is noted from the Southern and Mid-West sections, particularly in Indiana and Ohio.

The Paige Motor Car Corp. has sent H. Krohn, sales manager, on a special trip through all of the Southern and Western states, including Florida, Georgia, Kansas and Texas for the purpose of investigating general business conditions.

A scarcity of Ford cars both new and used is reported by dealers in the South. Ford dealers from the Southern states arrived in Detroit this past week searching for car loads of used Fords. The Motor Mart in Detroit supplied one of these dealers with one car load and another with four car loads. There seems to be a larger quantity of used Fords in Detroit than in the South and the Southern demand makes it profitable to buy in Detroit and even to pay the freight charges to the South.

Ford Makes First Shipment of Tractors

DETROIT, Oct. 17—The Ford Motor Co. has this week shipped to England the first consignment of tractors. Production is now standardized and the following shipments will be made regularly until the entire quota of 7000 is completed.

Henry Ford has bought \$10,000,000 of Liberty Loan bonds, half for his own account and half for the company.

Tractor Attachment Makers Organize

CHICAGO, Oct. 15—Representatives of the tractor attachment makers met here today and perfected a permanent organization to be known as the National Tractor Attachment Association. J. H. Palmer, of the Farm Tractor Co., Fond du Lac, Wis., was elected president; V. P. Wilkins, of the Unitractor Co., Chicago, vice-president, and Fred M.

Loomis, of the Smith Form-a-Tractor Co., Chicago, secretary and treasurer. Just what form the policy of the association will assume has not been determined definitely. The association contemplates a campaign of education to show the farmer how he can use the power he already has with a tractor attachment economically and efficiently.

The next meeting will be held in Chicago the first Monday in November. Those represented at the meeting were: Curtis Form-a-Tractor Co., Chicago; Farm Tractor Co., Fond du Lac, Wis.; Unitractor Co., Chicago; Pullford Co., Quincy, Ill.; Geneva Tractor Co., Geneva, Ohio; 3-P Auto Tractor Co., Davenport, Iowa; Smith Form-a-Tractor Co., Chicago; the Armstrong Bureau of Related Industries, Chicago; the Hyatt Roller Bearing Co., Chicago, together with various farm trade journals. The meeting was called by President Pro Tem L. H. Boydston, who instituted the movement for the association, but who is no longer connected with a manufacturer of tractor attachments.

Alley, Mulford and Henderson Win at Chicago

CHICAGO, Oct. 13—Alley won his first speedway race to-day at the local track, when he came in first in the 10-mile event with his Pan American in 11:22.10, at 105.6 m.p.h. Mulford stepped up from third to first in the second event of 50 miles, winning in a Frontenac in 28:18.75. Henderson in a Roamer Special took the third event of 50 miles in 27:22.21 with Mulford a close second, his time being 27:27.27.

Chevrolet in his Frontenac was a close second in the 10-mile event, his time being 11:22.28. Anderson in a Miller Special came in second in the second event.

Hale & Kilburn Plans Reorganization

PHILADELPHIA, Oct. 15—The Hale & Kilburn Co., body builder, is planning a new company to take over the present business and property. At a recent special meeting of the stockholders, they were informed of the company's financial difficulties, due to the fact that \$750,000 5 per cent notes were due Oct. 1, and that \$850,000 of short-term paper would mature within 4 months. As a result a new financing plan was made by the stockholders. Under this plan the present company will sell to a syndicate for \$1,850,000 cash the \$1,000,000 of new notes or bonus, the \$1,000,000 new 8 per cent preferred, and the 19,676 shares of common stock, the sale being conditional on the present preferred holders purchasing \$500,000 of the new preferred at 95, with a bonus of one and one-half shares of new common.

Shotwell Receivership Discharged

INDIANAPOLIS, Oct. 15—The receivership of the Shotwell Pump & Tank Co. has been discharged. The firm is solvent and able to take care of anything it owes and can go ahead with the manufacture of pumps and oil storage systems.

Five New Models for Crow-Elkhart

Differ From Previous Designs Chiefly in Body Lines and Appointments

ELKHART, IND., Oct. 12—The series K Crow-Elkhart cars just announced by the Crow-Elkhart Motor Co. of this city will consist of a five-passenger touring car at \$935, a five-passenger DeLuxe touring car at \$995, a four-passenger DeLuxe cloverleaf roadster at \$995, a convertible coupé at \$1,195 and a convertible sedan at \$1,275. Wire wheels will be furnished on any model at an extra charge of \$100.

There have been comparatively few changes in the mechanical features, which include a unit power plant with Borg & Beck clutch, a Stewart vacuum feed with 12 gal. gasoline tank at the rear, instead of the cowl tank previously used, Timken bearings in all wheels and the Hotchkiss drive. The most notable improvement has been made in the bodies. The five-passenger car has a torpedo body with a slanting windshield having an oval base. Upholstering is in long grain leather, the deep pleated cushions being 21 in. in depth. At the top of the front seat is a metal back, which gives a double cowl effect. Additional leg room for the front seat has been secured by removing the fuel tank from under the cowl and placing it in the rear.

No important changes have been made in the design of the four-passenger cloverleaf roadster, which has, however, been refined and had its conveniences added to. It now has a slanting windshield, a khaki top, nicked radiator and a more convenient arrangement of the control instruments. On the five-passenger convertible sedan the plate glass sides drop entirely out of sight when the car is to be used as an open touring vehicle, into felt beds at the sides, which prevent the glass from rattling. This model is upholstered in whipcord. Notable features include a closed dome light and individual front seats. The three-passenger coupé has a similar plate glass arrangement to that of the five-passenger sedan.

Six Body Styles for 1918 Jackson

JACKSON, MICH., Oct. 15—Six body styles on one 118 chassis makes up the Jackson Eight line for 1918. Mechanically, the chassis is the same as last year with a few minor improvements, the main changes being in body style only. The line is made up of a 5-passenger touring model at \$1,495; a four-passenger designated as the Flyer at \$1,575; a four-passenger cruiser at \$1,495; a two-passenger roadster at \$1,495; a seven-passenger touring at \$1,570, and a seven-passenger sedan at \$2,195.

The leader of the line is the "Flyer" model, which is a long and low racer type. This model is offered in a choice

of four colors including the standard blue with black band and white stripe. There is a sudden drop from the cowl to the side in this model which, with the straight line to the back of the car, gives it a touch of distinction. As the name Cruiser would indicate, this four-passenger model has the side body line dropping in a gradual slant from the cowl to the rear.

Tires are 34 by 4. The bodies of the open cars, with the exception of the Flyer, are finished in maroon with the chassis black and the wheels natural wood, but special colors may be had for an additional \$25. The equipment is specially complete and includes a Stewart tire pump driven from the transmission case. A special equipment of the Flyer model includes an 8 day clock, Moto-Meter, tonneau light, and cigar lighter.

Case Has New Six

RACINE, WIS., Oct. 1—The J. I. Case T. M. Co. will have a single chassis model passenger car for 1918, this being a six-cylinder which replaces the four-cylinder type. This means that the Case company will abandon the manufacture of automobile engines, it having hitherto made its own motor.

The car as a whole is larger, having had 5 in. added to the wheelbase, which is now 125 in. The tires are increased to 35 x 4½ and the cantilever spring has been abandoned, half elliptic being substituted. Other stock parts used are Borg & Beck clutch, Grant-Lees gearset, and Columbia spiral bevel rear axle. There will be three body models, a seven-passenger, a four-passenger sport type and a Springfield variety. It is stated that the new car is lighter than the old four, weighing under 3200 lb.

There is good equipment, including Stewart vacuum fuel feed, Stewart speedometer and Stewart tire pump. Prices have not yet been announced.

New Anderson Convertible Sedan

ROCK HILL, S. C., Oct. 15—The new Anderson convertible sedan, made by the Anderson Motor Co., seats five passengers and sells for \$2,165, with five wire wheels \$110 extra. It is provided with individual front seat, staggered doors and is offered with a two-tone color combination. The body is aluminum to insure light weight and the frame is made of seasoned wood braced and counter braced with joints mortised, insuring a job free from rattles and rumbles. The finish is hand applied and hand rubbed. The interior is upholstered in fine fabrics in tones to match the body colors. There is a dome light. Cushions are deep and wide and there is plenty of leg room. The driving controls are easy to reach and comfort in cold weather is enhanced by the presence of a Perfection heater.

Curtiss Increases Wages

BUFFALO, Oct. 17—The Curtiss Aeroplane Corp. has increased the wages of its employees. It is said the increase will total \$8,000,000 a year.

Velie Has Nine New Body Lines

Slight Mechanical Refinements and Addition of Sport Model Outstanding Features

MOLINE, ILL., Oct. 13—Nine body styles with improved lines, the addition of a sport model, and slight refinements in mechanical details briefly sum up the changes for 1918 in the two six-cylinder Velie chassis.

The sport model, on the larger chassis, is a four-passenger low-hung, with deep seats and individual steps replacing the running boards. The exhaust manifold extends through the hood and a two-way valve acts as a muffler cutout. Boyce Moto-Meter, power tire pump and victoria top are standard equipment and the price is \$1,850. The price of the regular seven-passenger model on this chassis is \$1,595, a reduction of \$55 from the previous model.

In appearance, the new five-passenger on the smaller chassis is strikingly different. The higher radiator produces an almost horizontal hood line.

Six other bodies are available on this chassis. The four-passenger roadster has a double cowl and greatly increased leg room; the two-passenger roadster has new lines; the coupé has seating room for four, the cabriolet with large side windows has room for three; the five-passenger touring sedan with staggered doors and reversible front seat and a brougham or town car complete the styles. Perfection exhaust heaters are used on all closed models.

The prices of the models on the smaller chassis are: Five-passenger, four-passenger and two-passenger, \$1,265; cabriolet, \$1,750; sedan, \$1,835; coupé, \$1,850, and town car, \$2,400.

Will Make Small Cycle Car

TOLEDO, Oct. 13—A small gasoline-driven cycle car will soon be manufactured by the National Juvenile Auto Co., of this city, according to an announcement made at the fourth annual meeting of officers this week. Low upkeep and operating costs are to be the feature of the new machine, and it is expected that a mileage of from 80 to 90 m. p. g. may be obtained. The following officers were elected at this meeting: Dr. H. C. Kuebler, president; K. C. Merrill, vice-president; J. G. Hickok, treasurer; George Wideman, assistant treasurer; Robert L. Hinds, secretary, and Charles F. Hamel, general manager.

Drexel to Be Auctioned Oct. 24

CHICAGO, Oct. 16—The Drexel Motor Car Corp. stockholders have failed to present a plan for refinancing the company which is satisfactory to the creditors and the property is ordered sold at auction Oct. 24 at a minimum price of \$102,000.

Monarch Tractor Formed —W. M. Smith President

TORONTO, ONT., Oct. 15—The Monarch Tractor Co. has recently been incorporated in Canada and has made arrangements to build a factory in Toronto. The output of the factory here will be devoted to the foreign trade, as well as to the sales in the Dominion. The first 250 machines to be built here will be delivered to the seaboard for the French government during the season of 1918.

W. M. Smith is president of the new company. Offices have been opened in Toronto, in charge of G. R. Creelman.

The Monarch Tractor is made in three sizes, for handling either four, three or two plows and other tools and implements using similar power.

MONTREAL, QUE., Oct. 15—The S. & F. Motors Corp., Ltd., has been incorporated with a capital stock of \$46,000 by Arthur Sansoucy, of Troy, N. Y.; Mitchel Trend, of Montreal, Que.; Alexander N. Dufresne, of St. Cesaire, Que., and others to manufacture automobiles, airplanes, motors, engines, etc.

AKRON, Oct. 12—The Mackey Motor Co. has been capitalized for \$250,000 and plans to manufacture a four-wheel drive automobile. J. C. Mackey is president and manager; J. A. Backman, vice-president and director; A. A. Miller, sales manager; J. A. Seller, secretary and treasurer.

Jorgenson Starts Operations

WAUPACA, WIS., Oct. 15—The Jorgenson Mfg. Co., which recently was incorporated with a capital stock of \$70,000 to manufacture gas engine primers, carbureters and similar accessories, has started operations in the plant of the Waupaca Felting Mills, which have been leased with the privilege of purchase. The company has been manufacturing accessories at Tustin, Wis., for some time past, but is greatly enlarging its activities. Upon the incorporation of the business, the following officers have been elected: President, J. P. Jorgenson;

New Companies Formed

Latest additions to ranks of Automotive Industries

GREEN BAY, WIS., Oct. 12—The Crank-Shaft Movement Corp. has been incorporated with a capital of \$300,000 to manufacture motors.

MONTCLAIR, N. J., Oct. 12—The Wood-Seal Co. has been formed, with a capital of \$75,000, to manufacture automobile supplies. W. V. Ash and A. C. Buell, of Montclair, are the principal incorporators.

ST. LOUIS, MO., Oct. 13—The Mueck Auto Body Co., capitalized at \$30,000, will manufacture passenger car and truck bodies and wheels. Frank W. Mueck is president and W. Happel vice-president.

DETROIT, MICH., Oct. 15—The Liberty Motor Car Co. of Detroit has incorporated under the Canadian laws as the Liberty Motor Car Co. of Canada, Ltd., of Windsor, Ont. The incorporators are, Percy Owen, president; J. F. Bourquin and Harland M. Worth, and the capitalization is \$10,000.

vice-president, Julius Jorgenson; secretary and treasurer, C. A. Jorgenson; directors, the officers and N. Cohen.

Complete Factory Plans

DETROIT, Oct. 15—The Air-O-Flex Truck Co. has completed the plans for its factory buildings, and construction of the first unit, containing 100,000 sq. ft. of floor space, will be started soon. This unit will care for an output of 10 trucks per day, and two other similar units, exclusive of the administration buildings, will be added as the business increases. The feature of this truck is to be the

Mixrite Carburetor Co. Formed in Decatur

DECATUR, ILL., Oct. 12—The Mixrite Carburetor Co., Decatur, Ill., has been incorporated with capital stock of \$30,000. The incorporators are Charles Gillespie, Edward H. Williams, both of Decatur, and A. A. Granger, of Forrest, Ill. A new type of carburetor invented by Gillespie, is to be manufactured, which, while adapted to any car, is designed especially for a Ford. It is claimed that the carburetor will save gasoline, while other advantages are enumerated by the promoters. A factory will be erected as soon as a suitable site can be found and the invention manufactured upon a large scale. Temporarily, the Faries Manufacturing plant, of Decatur, will construct enough to take care of advance orders.

HAMILTON, ONT., Oct. 15—The Canadian Hession Tillers & Tractors, Ltd., Hamilton, Ont., has been incorporated with a capital stock of \$5,000,000 by Henry D. Petrie, Alexander M. Snyder, Adam H. Hope and others to manufacture tractors, farm implements, tools, etc.

McKee Opens Advertising Agency

INDIANAPOLIS, Oct. 12—Homer McKee, advertising manager of the Premier Motor Corp., has opened an advertising agency in this city under the firm name of The Homer McKee Co., Inc.

method of body suspension. Springs are eliminated, and the body is carried on a combined oil and air cylinder, whereby the pressure or vacuum may be graduated to conform with the load.

Howe Enters Tail Lamp Field

CHICAGO, Oct. 15—The Howe Mfg. Co., maker of the Howe spotlight, has entered the tail lamp field. All of its tail lamps are equipped with National Mazda 6 volt, 2 candle power bulb, double contact unless otherwise specified. The lenses are ruby semaphore and the finish is high grade black enamel.

Automobile Exhibits at Electrical Show

(Continued from page 687)

styles of upholstery. In regular service, a mileage of 80 to 100 can be expected from one charge of the batteries, according to conditions, and the car has a speed range up to 30 m. p. h.

Storage Battery Exhibits

Three manufacturers of storage batteries are represented at the show, the Electric Storage Battery Co. of Philadelphia, the Philadelphia Storage Battery Co., of the same city, and the Edison Storage Battery Co., of Orange, N. J. The Electric Storage Battery Co., besides its chloride batteries used for stationary installations, exhibits its Ironclad Exide battery automobile starting, lighting and ignition. The latest improvement in the XC type of battery relates to the cover construction, and this type is claimed to possess greater starting ability than any other type of equal weight, this being

due to the unit cell construction. A very light covering of insulating compound is placed over the cells of a battery, which can be very quickly removed by means of a torch or by immersing the battery in hot water, after which any of the cells can be removed without disturbing the others. Owing to the absence of a heavy cover of insulating compound, as well as compound between individual cells, space and weight are saved and the specific capacity of the battery is increased. The new cover construction of the XC type prevents over-filling of the cells and makes it unnecessary to carefully watch the amount of water being put in at any time.

The Philadelphia Storage Battery Co. features the Diamond Grid type of battery, and the Edison Storage Battery Co. exhibits its line of Edison alkaline batteries, which are used for electric vehicle propulsion and for lighting and ignition on gasoline cars.

Drysdale Leaves Cadillac to Sell Cleveland Tractor

DETROIT, Oct. 12—K. P. Drysdale, who for the past 12 years has been advertising manager of the Cadillac Motor Car Co., has been appointed director of sales promotion for the Cleveland Tractor Co., Cleveland, and has resigned from the Cadillac company. He will assume his new position Oct. 16. The Cleveland Tractor Co. is manufacturing a small creeper tractor designed by Rollin White, formerly of the White Motor Co. It is stated that the capacity of the present tractor plant is overtaxed and that larger buildings are to be erected in the near future. The capitalization of the company has recently been increased from \$600,000 to \$6,000,000.

Philip S. Russel has resigned as director of sales of the Hale & Kilburn Co., Philadelphia, to be associated with the Marlin-Rockwell Corp., New Haven, with offices located in its Standard Roller Bearing plant, Philadelphia. He is not completely breaking his relations with the Hale & Kilburn Co., whose interests in certain directions will be taken care of by him.

Harry W. Miller, formerly service manager of the Chalmers Motor Co., has been promoted to assistant sales manager and service supervisor.

Harry Hamilton, assistant purchasing agent of the Dayton Engineering Laboratories Co., Dayton, Ohio, has become purchasing agent for the Dayton-Wright Airplane Co. He is succeeded at the Delco factory by Bert Hutchings, who in turn is succeeded by J. B. Shephard.

O. S. Beroth has resigned as assistant purchasing agent for the National Motor Car & Vehicle Corp., Indianapolis, to become manager of the service department of the Indiana Truck Corp., Marion, Ind.

F. H. Akers, who for the past 5 years has been in the employ of the Reo Motor Car Co., as factory representative covering the central western states, has been appointed assistant sales manager.

B. D. Gray, formerly of the West-Bright Bearing Co., has been made a major in the Signal Corps Reserve Army.

E. E. Gerlinger has become Pacific coast sales manager of the Selden Truck Sales Co., Rochester, N. Y. Mr. Gerlinger formerly was vice-president and general manager of the Gerlinger Motor Car Co., Portland, Ore.

W. H. P. Reilly, of the Ajax Rubber Co., has been appointed Pacific Coast sales manager, with headquarters at San Francisco.

W. A. Booth, of the Standard Steel Tube Co., has been appointed manager in charge of the Detroit office.

Men of the Industry

Changes in Personnel and Position

Charles E. Davy, formerly general superintendent of the United States Motor Truck Co., Cincinnati, has become experimental engineer of the Denby Motor Truck Co.

E. A. Callahan, assistant manager of the Omaha Branch of the Willys-Overland Co., and formerly with the purchasing department at the factory, has been appointed a captain, and according to reports, will be connected with Major H. L. Sheppler, in the airplane production department.

R. T. Yeats has resigned as director of sales and exports for the Detroit Motor Car Co., but has as yet made no announcement of his future plans.

George O. Morgan, formerly of the Toledo branch of the Willys-Overland Co., has been promoted to the general branch department at the factory. Morgan is succeeded by John Yoke, formerly assistant sales manager of the Smith Motor Truck Co.

Walter G. Jarmen has been appointed sales manager of the Jackson Automobile Co. He was formerly treasurer of the Canadian Briscoe Motor Co.

W. R. Averill, formerly connected with the sales department of the Burroughs Adding Machine Co., the Dictaphone Co., and the Packard Co., has been appointed sales manager of the Thompson Auto Co., distributor of Federal trucks in the Detroit territory.

O. H. Clafin will represent the Ohio Happy Farmer Tractor Co., Bucyrus, Ohio, in northeastern Ohio. Mr. Clafin was with the Olds Gasoline Engine Co., Lansing, Mich., for 8 years and for 5 years was with the Domestic Engine Co., Shippensburg, Pa.

M. W. Mosta, formerly with the Continental Motor Co., has joined the engineering staff of the Curtiss Airplane Co.

R. L. Newton, formerly district manager of the Willys-Overland, Inc., has resigned to become manager of the wholesale department of the Simons Sales Co., Overland distributor, Detroit.

Wyman C. Parker, secretary, treasurer and general manager of the Parker Rust Proof Corp., Detroit, has resigned. He will, however, retain his stock interests and will continue as director of the corporation.

Delling Chief of Saxon Inspection Department

DETROIT, Oct. 13—E. M. Delling has been promoted to chief of the inspection department of the Saxon Motor Co. Mr. Delling was formerly with the Mercer Automobile Co., Trenton, N. J.

A. F. Knobloch has become general manager of the Cleveland Motor Plow Co., Cleveland. Knobloch resigned as vice-president and general manager of the Cole Motor Car Co., Indianapolis, about a month ago, and before that time was connected with the Northway Motor & Mfg. Co. of Detroit. The Cleveland Tractor Co. is headed by Rollin H. White, formerly of the White Motor Co., and is manufacturing a creeper tractor.

Wallace C. Hood has become sales manager of the King Motor Car Co., Detroit. Mr. Hood will continue as president of the Wallace C. Hood Service Bureau in Detroit. Frank M. Eldrege, secretary and treasurer, will become general of the bureau.

E. A. Haskins has accepted a position with the United States Motor Truck Co. as assistant to the chief engineer and superintendent of service. Mr. Haskins was formerly factory manager of the Detroit Motor Truck Co. and before that service manager of the Federal Motor Truck Co. He will take up his new duties between Nov. 1 and 15.

D. M. Trombley, district sales manager in the Northwest for the Premier Motor Corp., Indianapolis, has resigned, but as yet has made no announcement of his future connection.

T. J. Little, Jr., has been appointed research engineer of the Cadillac Motor Car Co. He will direct all research work, have charge of experimental laboratories and carburetor development, etc. For the past year Mr. Little has been directing special engineering investigation, and was formerly chief engineer of the Welsbach Co.

B. F. Winkelman, formerly with the Chalmers agency in Philadelphia has become district supervisor of the Liberty Motor Car Co., Detroit.

H. S. Daniels has become advertising manager of the Dort Motor Car Co. For some time Mr. Daniels has served jointly the Dort Motor Car Co. and the Dooley-Brennan Co. but has now severed his connections with the latter organization.

ELECTIONS

ST. LOUIS, Mo., Oct. 15—George C. Griffith, president of the Mogul Motor Truck Co. has been elected a director of the Dorris Motor Car Co., which recently absorbed the Mogul Motor Truck Co. plant. B. E. Chappelow, president of the Chappelow Advertising Co., was also elected a director. R. A. Gray, formerly with the Chappelow company, has been made wholesale manager.

Chandler Shipments 33 1-3 Per Cent Larger

CLEVELAND, Oct. 12—Chandler Motor Car Co. shipments up to Oct. 1 were close on to 14,000, or about 33 1/3 per cent ahead of a year ago. The output of 14,000 machines for 10 months compares with 13,073 for the full year 1916.

To date Chandler has earned over \$30 a share, and for the full 12 months profits are estimated between \$2,300,000 and \$2,500,000, or between \$33 and \$35 a share.

Based upon an invested capital of \$5,000,000, Chandler will have to pay in 1917 an excess profits tax of \$800,000, which is the equivalent of slightly over \$11 a share. So that final earnings for the 70,000 shares should be between \$22 and \$24 a share, or practically twice the \$12 dividend.

\$1,000,000 Building Plans for Hascall

LUDINGTON, MICH., Oct. 12—The Hascall Mfg. Co. announces its intention to immediately invest \$1,000,000 in new buildings and machinery for construction of veneer parts for airplanes. It is stated that several large government contracts have been secured and the company plans to employ 3000 workers after completion of the factory.

Fuller & Sons Double Floor Space

KALAMAZOO, MICH., Oct. 12—The Fuller & Sons Mfg. Co. has begun to move and install machinery and equipment in its new No. 4 factory, nearing completion. The addition of this building will more than double the floor space, together with the new heat treating plant.

Detroit Products Building Nearing Completion

DETROIT, Oct. 15—The new office building of the Detroit Steel Products is rapidly nearing completion, and will be ready for occupancy about Dec. 1. The building is three stories, of steel reinforced concrete construction, with solid steel sashes.

Westinghouse Announces Wage Increase

PITTSBURGH, Oct. 12—Another increase in wages for its 20,000 shop employees aggregating nearly \$2,000,000 a year has just been announced by the Westinghouse Electric & Manufacturing Co. Effective Oct. 16, all employees observing shop hours, except munition workers, will receive an additional bonus of 10 per cent, if they are on a salary or time-rate basis, and of 7 per cent if they are on a piece, premium or task basis. Increases since the outbreak of the war amount to about 60 per cent.

Fender Makers Purchase Land

CLEVELAND, Oct. 12—G. F. Mitchell & Sons Co., manufacturer of automobile fenders at Cedar Avenue, S.E., and East Sixty-fifth Street, has purchased 6 acres of land fronting on the Nickel Plate Railroad for the immediate erection

Current News of Factories

*Notes of New Plants—Old Ones
Enlarged*

tion of a factory to cost approximately \$100,000. This factory is to be fireproof and of saw toothed construction, with six fifty-foot units each 300 feet in length.

Oneida Truck Plant Nearly Completed

DE PERE, WIS., Oct. 12—The Oneida Motor Truck Co. is rapidly completing the construction of its plant and will have it completed within a few weeks. At present the walls are up and the roof will be put on this week.

Star Motor Sells Plant

ANN ARBOR, MICH., Oct. 12—The Star Motor Co. has sold its plant to the Parker Mfg. Co., Detroit, and the machinery is being transferred from Detroit as rapidly as possible.

New Era's Detroit Offices Discontinued

DETROIT, Oct. 15—The New Era Spring & Specialty Co. is discontinuing its main sales office at Detroit, and establishing its general headquarters at their Grand Rapids, Mich., factory.

Victor Wire Wheel Equipping Plant

KALAMAZOO, MICH., Oct. 12—The Victor Wire Wheel Co. is shipping three carloads of machinery and equipment from Detroit, and will install them in the old Gibson mandolin plant. This company will manufacture spokes, nipples and wheels this fall.

Ohio Electric Busy

TOLEDO, Oct. 13—The Ohio Electric Car Co. has increased its factory workers to 200 and has a large amount of business on hand. This concern manufactures electric automobiles and bodies for gasoline cars.

About half of the work of the company is devoted to the body manufacture and the concern has 200 closed car and 100 roadster bodies in process of construction. Many of these are special taxies, roadsters and jitneys for the Willys-Overland Inc., as well as special bodies for private owners.

According to E. L. Hoffman, assistant general manager, there is a marked increase in the demand for electric cars.

Milburn Works on Oldsmobile Bodies

TOLEDO, Oct. 13—The Milburn Wagon Works is now doing the finishing work on all Oldsmobile closed cars and at present is turning out fifteen bodies a day. The chassis are shipped from Lansing to Toledo, where the bodies are added and completed.

Chevrolet to Build New Factory and Additions

DETROIT, Oct. 13—The Chevrolet Motor Co. will build a new \$100,000 factory building and a \$30,000 addition to its plant. Additional permits call for a \$15,000 addition and for the construction of a roof over the court between the factory buildings costing \$15,000.

Tire Factory for Ardmore

ARDMORE, OKLA., Oct. 15—The Ardmore-Akron Tire & Rubber Co. has started construction on its tire plant. All the machinery has been purchased. The plant will be 90 by 300 ft. and will be built in units, the first unit to be large enough for the installation of machinery to produce 1000 tires per day.

Western Carburetor May Increase

ALMA, MICH., Oct. 12—The Western Carburetor Co. has received a contract from the Karo Carburetor Co., Chicago, which will increase the output of the plant from seventy-five to 200 carburetors daily. Doubtless this will mean that the plant will have to triple its capacity in the near future. The company manufactures kerosene carburetors.

Phelps Engine to Move

ROCK ISLAND, ILL., Oct. 12—The Phelps Gasoline Engine Works, Wilton, Iowa, will remove shortly to Rock Island. R. W. Phelps, representing the company, has accepted an offer made by the Chamber of Commerce, the plant to occupy the west half of the National Neck Yoke Co.'s building, and to become one of the units, the product of which is used by the Marmon Manufacturing Company, recently organized to market farm lighting plants. The Phelps company will employ thirty men at the outset and this number will be gradually increased as business conditions warrant.

National Used Car Sale for Packard

DETROIT, Oct. 15—The Packard Motor Car Co. on Oct. 10 started a national used car sale which will last to Oct. 20. It is planned to hold the campaign by all the Packard dealers at the same time.

Standard Woven Fabric Issues Booklet

WALPOLE, MASS., Oct. 8—The Standard Woven Fabric Co. has issued a booklet entitled "Dimensions of Brake Linings and Truck Facings." In AUTOMOTIVE INDUSTRIES of Oct. 11 an error was made in the heading, which stated that Raybestos had issued the booklet.

The Standard Woven Fabric Co. has included in this booklet full dimensions of brake lining and truck facings for practically all cars built within the past 4 or 5 years.

Book on Repairs by Acetylene Welding

NEW YORK, Oct. 15—"Turning Waste Into Profit" is the title of a book just issued by the Prest-O-Lite Co., Inc., of

Indianapolis, Ind. It is devoted exclusively to the possibilities of reclaiming broken and worn machinery and metal parts for service by oxy-acetylene process, and numerous illustrations of such reclamation are given.

Corbin Issues Catalog on Screw Products

NEW BRITAIN, CONN., Oct. 15—The Corbin Screw Corp., maker of coaster brakes, speedometers and automatic screw machine products, has issued an illustrated catalog covering its full line of screw products. Because of its technical data and other information, the catalog should be of convenience to those using or selling this kind of product.

Frasse Catalog of Interest to Steel Users

NEW YORK, Oct. 15—Peter A. Frasse & Co. have just issued a new catalog describing the various grades and finishes of Frasse steels and giving pertinent information regarding their purposes and uses. The catalog also con-

tains many important tables, and other information about steel in general, of interest to all steel users.

Pamphlet on Export Embargo

NEW YORK, Oct. 15—The American Steel Export Company has issued a new twenty-four page pamphlet giving the groups of countries and lists of materials affected by the President's proclamation and subsequent orders together with facsimiles of forms prescribed and an explanation of their use.

Northcliffe Visiting Ford Plants

DETROIT, Oct. 17—Lord Northcliffe, head of the British War Mission in the United States, spent to-day visiting the Ford tractor and motor plants, as well as several other automobile factories.

International Rubber Doubles Output

DENVER, Oct. 15—The International Rubber Co. has doubled its output with

the opening of two new factory units here. Already the contractors are at work erecting a four-story addition, which will add 90,000 sq. ft. of floor space to its plant and bring the annual production to 600,000 Gates half-sole tires. The new unit will be ready early in 1918.

Ross in Receivers' Hands

DETROIT, Oct. 17—Receivers are being appointed for the Ross Automobile Co., Definite announcement will be made in about a week. Important changes in the company's plans are expected. It is possible that the company will move to the Pacific Coast and concentrate on the eight-cylinder model instead of the six, as announced some time ago.

Harrow Tractor Plant in St. Clair

ST. CLAIR, MICH., Oct. 16—The A. T. Harrow Tractor Co. will build a plant in this city to manufacture tractors. The first unit will be used for assembly purposes only, in order to speed up output.

Calendar

ASSOCIATIONS

1918

Jan. 3-4—New York, Automotive Electric Assn. meeting.

CONTESTS

Oct. 24—Columbus, Ohio, Dixie Highway tour.
Oct. 27—New York Speedway Race.

SHOWS

Oct. 13-20—Atlanta, Ga., Atlanta Automobile Association, J. W. Ranshaw, Mgr.
Oct. 13-28—Dallas, Tex., Dallas Automobile & Accessory Dealers' Assn., State Fair.
Oct. 22-27—Worcester, Mass., Casino & Bancroft Hotel, E. H. Winchell, Publicity Mgr.
Nov. 12-17—Los Angeles, Cal., Motor Car Dealers Assn., Billy Sunday Tabernacle.
Nov. 12-18—Denver, Col., Automobile Trades Assn., Show Committee, Auditorium, G. A. Wahlgreen, Mgr.
Dec. 3-8—Akron, O., Akron Auto Show Assn., Auditorium Armory, O. G. Armstrong, Mgr.

1918

January — Kalamazoo, Mich., Kalamazoo Automobile Dealers' Assn., Armory.
Jan. 5-12—New York Show, Grand Central Palace, National Automobile Chamber of Commerce.
Jan. 11-19—Philadelphia, 17th Annual Show, Philadelphia Auto Trade Assn., Commercial Museum Bldg.
Jan. 11-19—Providence, R. I., R. I. Licensed Auto. Dealers' Assn., State Armory, Percival S. Clark, Mgr.
Jan. 19-26—New York Motor Boat Show, Grand Central Palace, National Assn. of Engine and Boat Manufacturers.
Jan. 19-28—Montreal, Can., Montreal Automobile Trade Assn., Ltd., Almy Bldg. T. C. Kirby, Mgr.
Jan. 21-26—Manchester, N. H., Academy, Couture Bros.
Jan. 21-26—Scranton, Pa., Scranton Motor Trades Assn., Armory, Hugh B. Andrews, Mgr.
Jan. 23-28—Allentown, Pa., Lehigh Auto. Trade Assn., Traylor Motor Co.'s Ga-

rage, P. W. Leisnering, Publicity Mgr.
Jan. 26-Feb. 2—Chicago National Show, Coliseum and Armory, National Automobile Chamber of Commerce.
February—Peoria, Ill., Peoria Auto and Accessories Dealers' Assn. W. O. Ireland, Mgr.
Feb. 11-16—St. Louis, Mo., St. Louis Auto Mfrs. & Dealers Assn., Robert E. Lee, Mgr.
Feb. 16-23—New York, Second Pan-American Aeronautic Exposition, Grand Central Palace and Madison Square Garden.
Feb. 18-23—Grand Rapids, Mich., Automobile Business Assn., Klingman Building, Ernest T. Conlon, Mgr.
Feb. 18-23—Newark, N. J., N. J. Auto Exhibition, Co. G. First Regiment Armory, Claude E. Holgate, Mgr.
Feb. 18-23—Des Moines, Ia., Des Moines Automobile Dealers' Assn., Coliseum, C. G. Van Vleet & Dean Schooler, Mgrs.
Feb. 18-23—Springfield, Ohio, Springfield Auto Trades

Assn., Memorial Hall, C. S. Burke, Mgr.
Feb. 18-25—Pittsfield, Mass., State Guard, State Armory, James J. Callaghan, Mgr.
Feb. 18-27—So. Bethlehem, Pa., Fourth Annual (cars 18-23; trucks 25-27), Coliseum, J. L. Elliott, Mgr.
March — San Francisco, Cal., Motor Truck Dealers of San Francisco, Auditorium, Ivan R. Gates.
Mar. 19-24—Cedar Rapids, Ia., Cedar Rapids Auto Trade Assn., Auditorium.
Apr. 9-13—Stockton, Cal., San Joaquin Auto Trade Assn., Samuel S. Cohn, Mgr.
Sept. 23-28—Chicago, National Accessory Show for Fords, Coliseum.

S. A. E. Section Meetings

Oct. 18—Metropolitan Section, Subject, "Aeronautics."
Oct. 18—Detroit Section, Subject, "Laboratory Tests."
Oct. 19—Cleveland Section, Meeting.
Oct. 25—Pennsylvania Section, Subject, "Springs," by W. C. Keys.

Engineering

American Railway Master Mechanics' Assn.
American Institute of Electrical Engineers.
Master Builders' Assn.
American Society of Heating and Ventilating Engineers.
Association Iron and Steel Electrical Engineers.
Mining and Metallurgical Society of America.
Society of Automotive Engineers.

OCTOBER

18—Mining & Met. Soc. Amer. monthly meeting New York section Engrs. Club.
20—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburgh section.

NOVEMBER

3—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.
8—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penn. section at Phila.
9—Amer. Soc. Heat. & Vent. Engrs. monthly meeting

Ohio Section at Cleveland.
10—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.
12—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ill. section at Chicago.
12—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mich. section at Detroit.
13—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mass. section at Boston.
15—Mining & Met. Soc. Amer. section at Engrs. Club.
15-16—Soc. Naval Arch. & Marine Engrs. annual meeting.
17—Assn. Iron & Steel Elec.

Illuminating Engineering Society.
National Electric Light Assn.
National Gas Engine Assn.
American Society for Testing Materials.
American Institute of Metals.
American Foundrymen's Assn.
Society Naval Architecture and Marine Engineers.

Engrs. monthly meeting Pittsburgh section.
19—Amer. Soc. Heat. & Vent. Engrs. monthly meeting New York section.

DECEMBER

1—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.
8—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.
10—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ill. section at Chicago.
11—Amer. Soc. Heat. & Vent.

Engrs. monthly meeting Mich. section at Detroit.
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